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Abstract: The literature reports the mean impact of trade preferences. The literature on the *agoa* impact is no exception. The mean impact can be sensitive to heterogeneity in the adoption of preferences by recipients. Nonetheless, the choice of countries included in the sample can play a role in determining the level of the impact. A small increase at the bottom of the distribution is more likely to present a large impact (in percentage terms) compared to the top 20% – 5%. In this paper, we investigate the gains to developing countries focussing on where they lie on the export distribution. This way, heterogeneity can be controlled for and the impact at various percentiles of the distribution can be estimated. We carry out a quantile regression on a sample of countries selected by matching countries on an estimated propensity score as well as the full sample for comparison. Secondly, we decompose the impact using methodology in the spirit of the Oaxaca-Blinder decomposition found in Machado and Mata (2005) for quantile regressions. We find that gains to *agoa* recipients is confined to the top 5% of the export distribution. On the contrary the gains to the recipients from exporting to the EU is mainly at the bottom 25% and the median. There is an unambiguous decline in their exports to the rest of the world relative to the counter-factual countries they are compared with. The decomposition exercise supports the quantile results and shows that both coefficient and the covariate differences between the two groups explain the difference in the total change at the various quantiles.

Keywords: Trade preferences, African Growth and Opportunity Act, Africa, Matching

[1]I have benefited from discussions with senior colleagues and peers at Sussex. As usual all remaining errors are entirely mine.

1 Introduction

Trade economists have been fascinated by non-reciprocal preferences for some decades now. This began with the introduction of the GSP by developed economies in the 1970s and continued into the 1980s and through till today with the introduction of newer non-reciprocal preferential schemes for developing countries. The EU and USA have a myriad of these schemes with some countries having membership of two or more schemes. There is large empirical literature that have devoted much attention to the analysis of the impact of trade preferences. Majority of the empirical literature have focussed on the EU's trade preferences (such as general system of preferences (GSP) GSP+, EU-African Caribbean Pacific (ACP) and Everything but Arms (EBA) preferences) with quite a few studying the impact of *agoa*. These have been varied, and vary along methodological lines (Cipollina and Salvatici, 2010b; Silva and Tenreyro, 2006); as well as the empirical implementation of the analysis (Cipollina and Salvatici, 2010b).

Much of the literature has centred on the definition of non-reciprocal preferences, that is whether to use dummy variables or preference margins to represent the preferences (for example, Cipollina and Salvatici, 2010a). Agostino et al. (2007); Aiello et al. (2010); Brenton and Hoppe (2006); Brenton and Ikezuki (2004); Collier and Venables (2007); Condon and Stern (2011); Frazer and Van Biesebroeck (2010); Gibbon (2003); Mattoo et al. (2003) and Tadesse and Fayissa (2008) are among the papers studying the impact of trade preferences for developing countries. Others have focussed on the utilization of preferences (Bureau et al., 2006; Nilsson, 2005, 2011; UNCTAD, 2003), there is also a subgroup focussing on preference erosion due to the multilateral liberalization of tariffs (Alexandraki and Lankes, 2004; Francois et al., 2006; Hoekman et al., 2006, 2009; Liapis, 2007; UNCTAD, 2007). Nonetheless, rules of origin that limit the use of preferences is also studied in the literature (Augier et al., 2004; Brenton and Manchin, 2003; Brenton and Özden, 2005; Cadot and de Melo, 2007; Carrere et al., 2011; Edwards and Lawrence, 2010). The dominant tool used by many of the articles listed earlier in analysing the impact is the gravity model [1]. In using the gravity model Silva and Tenreyro (2006) and Cipollina and Salvatici (2010b) have advocated for the use of the poisson pseudo maximum likelihood models to account for the numerous zeros found in trade data. These methods have been extended to firm level and tariff line data in recent papers (for example, Aiello et al., 2010)

This paper attempts to fit within this body of literature by analysing the impact of *agoa* on exports of recipient countries to the USA, EU and the rest of the world (ROW). We depart from the standard empirical applications mentioned above, by defining a counter-factual set of countries for the preference recipients. This is done by matching countries receiving the *agoa* preferences to a set of countries having similar characteristics but are not *agoa* beneficiaries[2]. Quantile regressions

[1] Collier and Venables (2007) is an exception and a few others.

[2] These characteristics include area of country, gross domestic product, population, whether landlocked, English or Spanish speaking, distance to the USA, religion, per capita gross domestic product, savings per gross national income, corruption, regulatory quality, voice & accountability, agricultural land area (% of total land area) and World Bank income classification (low/lower middle/upper middle income classification)

are then applied to the matched sample of countries. For comparison, the analysis is also performed using the non-matched sample. Using the quantile framework allows us to study whether the impact of *agoa* has had a heterogeneous impact on the recipients. Matching the countries reduces the heterogeneity of the sample of countries although the sample remaining does not become fully homogeneous. Removing some of the heterogeneity and using the restricted sample thus allows a cleaner estimate of the impact of the preference at the various quantiles. This might explain the large variation in the impact of *agoa* that is reported within the literature. The large sample in addition exaggerates the impact of *agoa* as would be shown in the results reported in section (5).

The paper seeks to answer the following questions, (a) has the exports of *agoa* recipients to other destinations suffered as a result of the *agoa* preference? (b) Are there any differences in the impact across percentiles of the export distribution? (c) what factors explain the raw difference in *agoa* and *non-agoa* recipients? and (d) is the quantile impact affected by the choice of countries used as the counter-factual? Our contribution is the careful construction of the counter-factual outcomes for assessing the impact of *agoa*. Secondly, we not only focus on the impact on exports to the USA but also provide evidence on the impact of the policy to exports of recipients to other destinations (EU and rest of the world) enabling a more conclusive assessment of the *agoa* impact.

The rest of the paper is organised as follows. Section 2, provides a brief review of the empirical *agoa* literature. Section 3, provides a descriptive and graphical portrayal of the efects of *agoa*. Section 4, presents the data and econometric approach. Section 5, discusses the results. Finally, Section 6 concludes.

2 Empirical literature

The empirical literature on *agoa* has mixed results. Studies such as Collier and Venables (2007); Frazer and Van Biesebroeck (2010) and Nouve (2005) do find all their impacts to be positive. On the contrary, studies such as Giovannetti and Sanfilippo (2009); Lederman and Özden (2007); McKay (2012); Mueller (2008); Nouve and Staatz (2003); Seyoum (2007); Tadesse and Fayissa (2008); Tadesse et al. (2008) and Zappile (2011) do report mixed coefficients. The direction of the impacts and size vary with the level of disaggregation of exports, the products chosen, the period covered by the study, the definition of the dependent variable and the estimation method used. In this section, we review the evidence presented in a few of the papers. Table (1) below provides a summary of existing studies on *agoa*.

Collier and Venables (2007) working with apparel exports for the period 1991 to 2005 for 110 countries do find a positive impact of *agoa*. They use the ratio of apparel exports to the US relative to exports to the EU as the dependent variable. They estimate that, the *agoa* apparel provision increased exports to the USA by 7.4 times that of the EU. In all seven regressions the estimated impact did not increase beyond a multiple of 14.2.

Similarly, Frazer and Van Biesebroeck (2010) using disaggregated imports find the impact to be around 42% for apparel products. On the other hand, AGOA-GSP and AGOA-Manufactured products report lower impacts of 13% and 15% respectively.

Lederman and Özden (2007) focus on geographical and political determinants to identify the impact of USA's trade preferences. The estimations are based on the gravity model. Unlike the literature focussing on the *agoa* impact, they reviewed additional preferences offered by the USA to other regions of the world. They find that most preference beneficiaries increase their exports up to three-fold relative to countries excluded from receiving the preferences.

Nouve (2005) uses various dynamic panel estimators to estimate the impact of *agoa*. Forty-six African countries are selected for the study covering the period 1996 – 2004. His approach is a departure from existing approaches—since the literature tends to avoid using lagged values of the export variable to identify the impact of *agoa*. The gravity model is the main specification adopted for the estimations. Nouve (2005) concludes that the contribution of an increase in *agoa* is 16 – 20 cents for every dollar increase in exports to the USA. A contrary result found by Nouve (2005) to the earlier literature, is that, apparel and textiles did not yield significant increases in total exports[3].

Nouve and Staatz (2003) using quarterly data for a sample of 46 African countries find inconclusive evidence on the impact of *agoa*[4]. Their analysis focusses on the agricultural sector and there is limited evidence of a strong impact in this sector within the existing literature. One might attribute this effect to the strong subsidies the EU and USA have on their domestic agricultural sector.

Giovannetti and Sanfilippo (2009) is the second paper presented that departs from the traditional impact studies. They measure the impact of Chinese exports on *agoa* exporters. They analyse whether the Chinese exports have crowded-out African exports to the American market. Based on disaggregated data on 48 African countries for the period 1995 to 2005, they find evidence of Chinese exports displacing African exports to the USA.

Mueller (2008); Seyoum (2007) and Zappile (2011) do not find any significantly positive impacts of *agoa*[5]. Finally,Tadesse and Fayissa (2008) study the impact using data between 1991 and 2006. They find some positive impacts for a number of HS2 digit products used in separate regressions. The estimates are decomposed into impacts due to exports in new sectors and exports due to a higher volume of exports in existing sectors. The strongest impact they find, are in the new sectors where exports have been 'initiated'. On the contrary, not much improvement is found in existing

[3]Recent work by Rotunno et al. (2012) also note that that China accounted for a large majority of apparel exports of Botswana, Kenya, Lesotho, and Madagascar. The apparel exports of these countries and a few others were mainly due to Chinese 'transshipments' to take advantage of the favourable rules of origin of *agoa* at the time. The 'transshipments' have declined markedly since the removal of quotas by the USA on Chinese apparel exports. Similarly, McKay (2012) finds that the end of the multifibre arrangement (MFA) has reduced the advantage *agoa* recipients had in apparel and textiles. Moreover, he questions whether *agoa* played any role in the success of apparel—rather, he attributes the success partly to the existing multifibre arrangement at the time.

[4]The maximum estimate of 759.5 which seems out of place in table (1) is due to having the dependent variables in levels rather than logs. However, for the regressions based on a log definition of the dependent variable the coefficients reported on the *agoa* dummy are less than 2. Again, this points to how the definition of the dependent variable can influence the estimated impact of *agoa*.

[5]Both Mueller (2008) and Zappile (2011) use a *Prais-Winsten* transformed least square regression while Seyoum (2007) adopts an *ARIMA* time series estimation method.

export sectors[6].

Table 1: Summary of the empirical literature

					Estimated coefficients			
Authors	Years	Countries	Data	Methodology	Mean	Min	Max	Number
Collier and Venables (2007)	15	World	Apparel & Textiles	OLS	2.086	0.900	2.650	9
Frazer and Van Biesebroeck (2010)	9	AGOA/World	All HS8 digit	OLS	0.308	0.030	0.452	4
Giovannetti and Sanfilippo (2009)	11	Africa	ISIC 3 - 6 digit	2SLS/GMM/OLS	0.030	-0.135	0.143	22
Lederman and Özden (2007)	1	World	Total trade	Tobit/Heckman	1.138	-0.811	2.027	5
McKay (2012)	21	AGOA & dev	Apparel & Textiles	OLS	0.129	-0.140	0.365	4
Mueller (2008)	11	AGOA	Total non oil	OLS	-0.163	-0.163	-0.163	1
Nouve (2005)	9	Africa	Total exports	Sys./diff. GMM	0.174	0.040	0.220	16
Nouve and Staatz (2003)	4	AGOA	Agricultural exports	OLS	159.546	-0.145	769.500	18
Seyoum (2007)	8	AGOA	Total imports	ARIMA	-0.929	-11.921	0.540	14
Tadesse and Fayissa (2008)	16	AGOA	All HS 2 digit	Tobit	1.010	-2.120	3.457	32
Tadesse et al. (2008)	16	AGOA	Total imp./SITC 1 dig.	Tobit	0.486	-1.224	2.912	13
Zappile (2011)	11	AGOA	Non Oil	OLS	-0.141	-0.141	-0.141	1

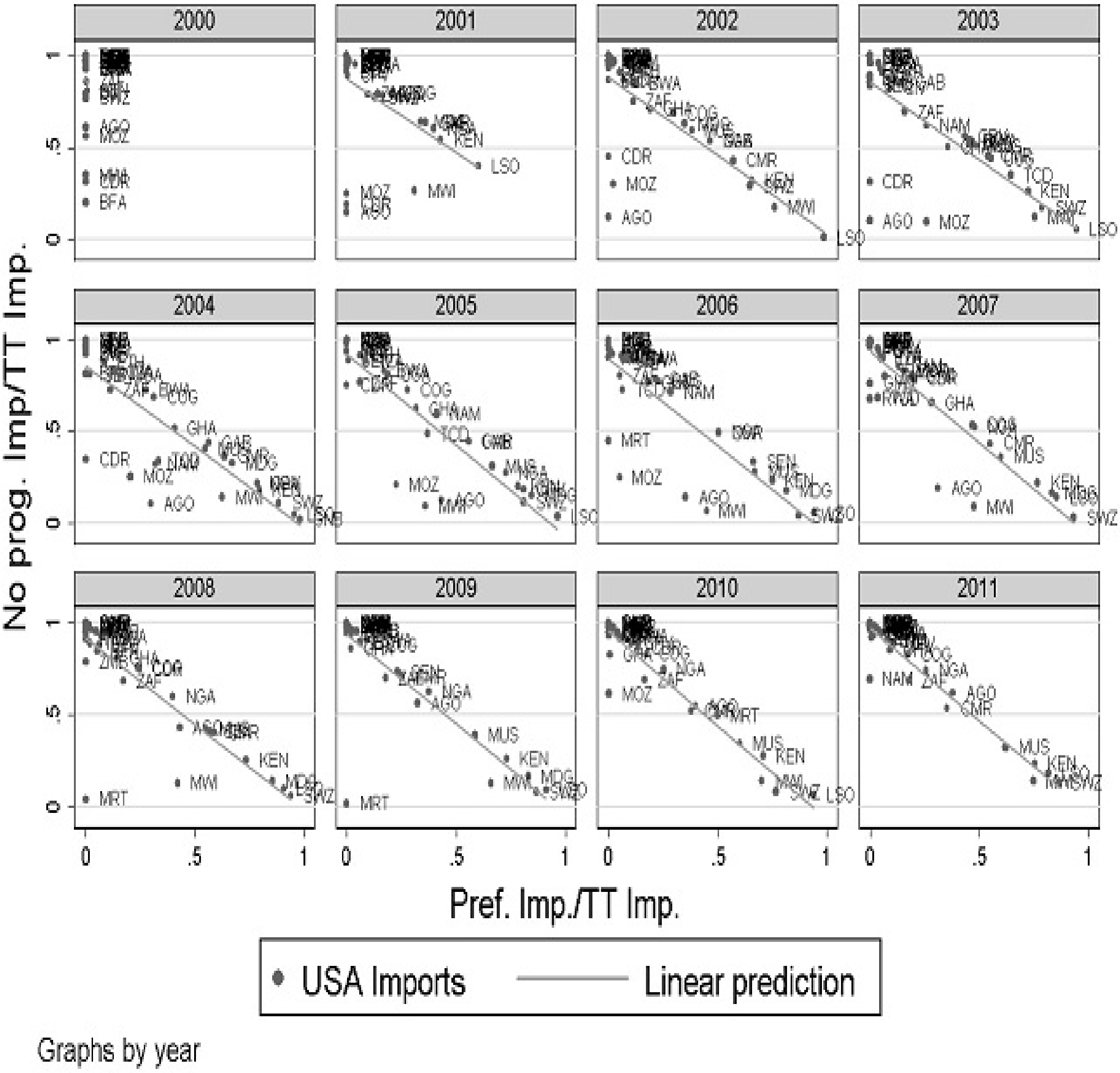
Source: Author's elaboration

3 Stylised facts about *agoa* exports to the USA

The first two figures in this section depict the changes in the share of preferential (*agoa*) imports into the USA as a result of its introduction. They chart how the recipients have lowered their share of no programme and GSP exports to increase their share of *agoa* exports in their total exports to the USA over the period 2001 - 2008. The increase in shares varies across the recipients. There is a clustering of countries in the top left and bottom right corners of the 2001 – 2008 sub figures in figure (1). An indication that not all countries have shifted exporting under no programme (MFN) to preferential exports. But the clustering of countries in the bottom right corner indicates that a number of countries have actually seen an increase in their share of *agoa* exports. Nonetheless there are some countries that have not taken advantage of the preference and still have their exports entering the USA under no specific programme. Several countries have one time or the other had an export share of *agoa* in their total exports to the USA above 30%. The second figure (2) makes the comparison between GSP and *agoa* imports by the USA from each of the recipients. Here the countries are clustered along the preferential import share axis. The figure indicates that fewer countries have a GSP export share greater than 30%.

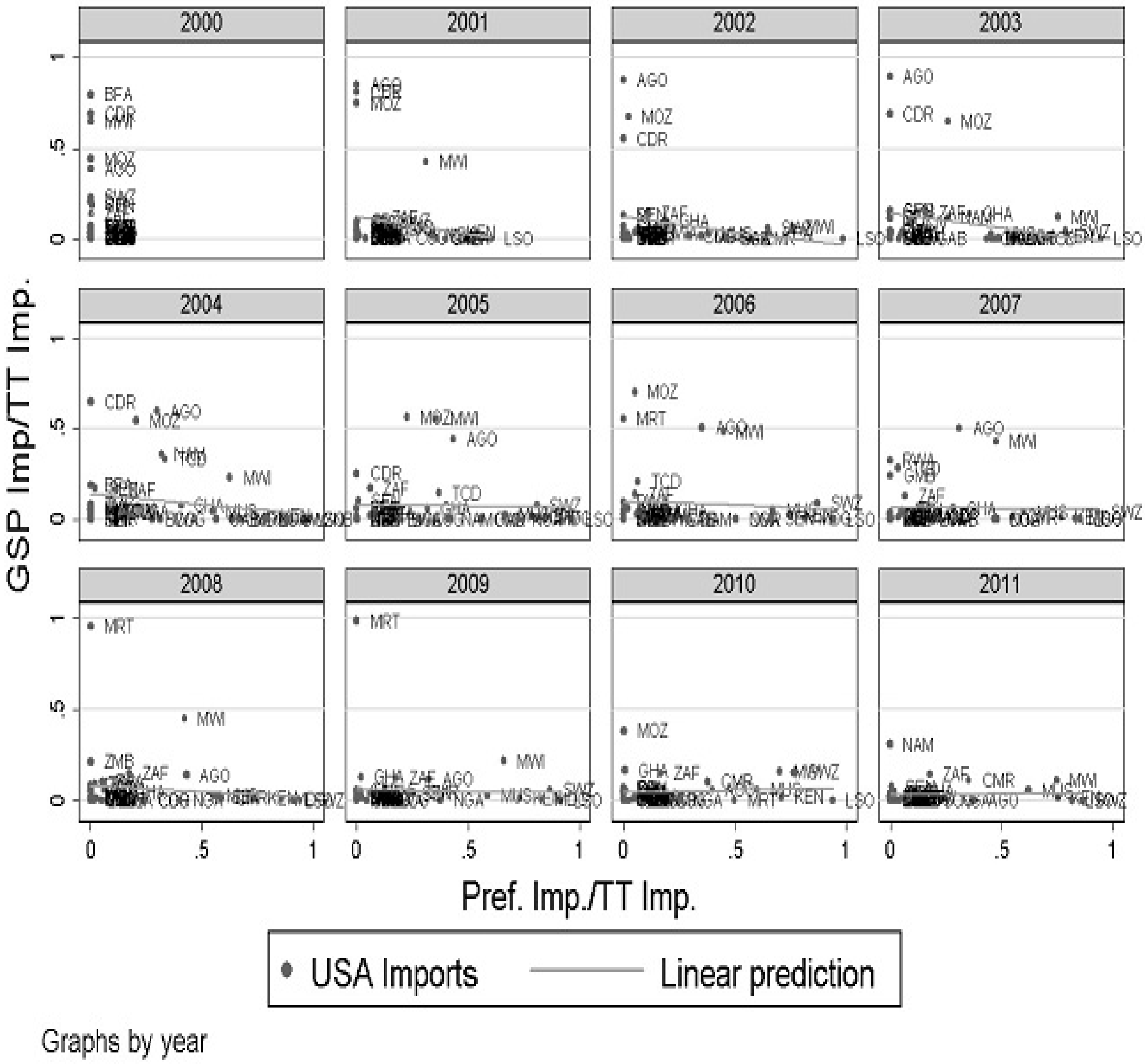
Much of the empirical analysis on *agoa* captures this increase in *agoa* depicted here. Thus, the seven-fold increase reported by Collier and Venables (2007) is justified by looking at how *agoa* have increased from a zero share to approximately 90% share for a couple of countries. It is however, useful to investigate how countries are faring with respect to their exports to other destinations and whether their exports to other destinations have suffered as a result of the *agoa* preference. One of the aims of the paper is to capture what has happened to the exports of recipients to other destinations.

[6] These impacts are associated with the extensive and intensive margins respectively as is popularly used in the trade literature.



Source: Author's elaboration based on the USITC database.

Figure 1: *agoa* vs. No Programme Shares in total Imports



Source: Author's elaboration based on the USITC database.

Figure 2: *agoa* vs GSP Shares in total Imports

The final figure in this section shows the trend in export shares for the top five *agoa* exporters—Nigeria, Angola, South Africa, Republic of Congo and Chad. In addition, quadratic and linear fitted lines are included. Nigeria, Congo and Chad display non-linearities in their export shares over time. Chad shows a marked increase in exports to the USA while there is a similar decline in exports to the EU. From the figure it points towards a shift of exports to the EU towards the USA to take advantage of *agoa*. Their share of exports to the rest of the world has stayed fairly at the same level throughout the period. In spite of the shifting of exports there is a gradual reversal of the increase in exports to the USA after 2006. At the same time exports to the EU has began increasing. Nigeria shows a similar pattern, however it is not as dramatic as the shares for Chad.

Another difference is that there is a gradual increase in Nigerian exports to the rest of the world. This increase is probably explained by exports of crude oil to neighbouring countries and China. Angola also shows a steep increase in exports to the rest of the world. Both exports to the USA and EU are also declining however, the decline in exports to the USA is relatively steeper. Again, Angola is a major oil exporter. Similarly, South Africa shows an increase in share of exports to ROW and a declining share to the EU. Although, there is a decline in the share of exports to the USA, this is much less pronounced relative to the EU. For Congo, Increases in the share of exports to ROW increases until 2004 and then, starts to decline. The share of exports to the USA increases throughout the period. The export share to the EU on the other hand turns upwards from about 2004.

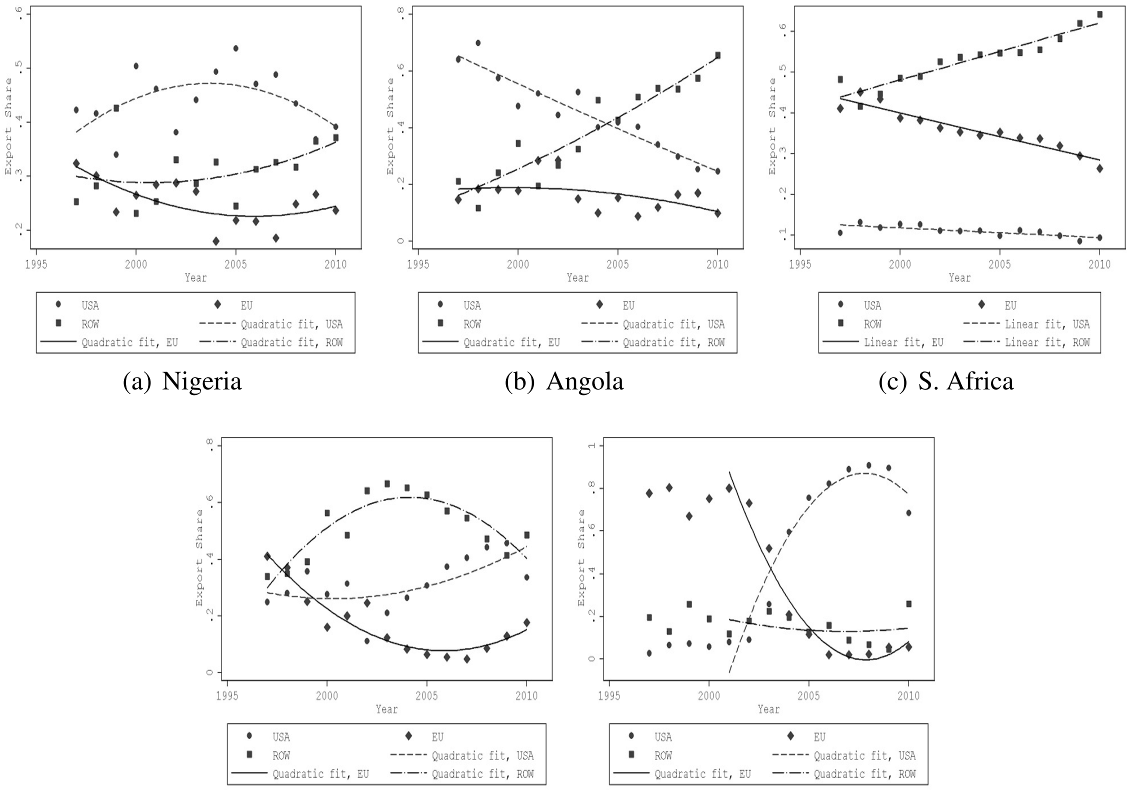
Although the graphs in this section show a pattern of higher shares of *agoa*, accounting for other destinations and comparing the performance to other countries *non-agoa* countries might provide a different picture of the impact. Moreover, a peek into the top five *agoa* exporters does show that the impact of *agoa* on their exports have been varied. Increases in the share of exports to the USA has been at the cost of shares to the other destinations. The larger the gains in the exports to the USA the larger the losses in shares to the other destinations. Nonetheless, not all countries have been able to sustain the increases in export shares to the USA. The analysis in the results section aims to through further light on their exports to other destinations.

4 Econometric Approach and Data

4.1 Quantile Regression Framework

In applying our regression analysis, we use the quantile regression estimator of Koenker and Bassett (1978). The decision to incorporate the quantile framework is to capture any differences that might occur at the various percentiles of the export distribution. Secondly, ordinary least squares (OLS) regression is sensitive to outliers and these can influence the results. The median regression on the other hand is less sensitive to outliers (see for instance Cameron and Trivedi, 2005; Wooldridge, 2002). Thus, using the quantile regression is useful in the presence of outliers. Besides, if treatment is heterogeneous then estimating the effect for various percentiles of the distribution is helpful in sorting out these issues. Thus, one can estimate the effects at the 25th percentile and also at the 75th percentile to show if there are any significant differences in the tails of the distribution. For the purposes of this paper, the 25th, 50th, 75th and 95th percentiles are estimated.

We have both cross-sectional and panel data available for the quantile regression analysis. The cross-section data poses no serious challenges for estimation and it is based on Koenker and Bassett (1978) and Koenker and Hallock (2001). However, our panel data poses some challenges for estimation and is discussed next. Several issues have been raised and researched into with regards to quantile regression for panel data (Abrevaya and Dahl, 2008; Canay, 2011; Firpo et al., 2009; Geraci and Bottai, 2007; Koenker, 2005; Powell, 2011; Rosen, 2012; Wooldridge, 2002). Given the



(a) Nigeria (b) Angola (c) S. Africa

(d) Congo (e) Chad

Source: Author's elaboration based on the UN Comtrade database.

Figure 3: *Shares of exports in selected countries*

following panel specification, there is the problem of how to treat c_i which is the unobserved effects.

$$Q_\tau(y_{it}|x_{it}) = x_{it}\theta_0 + c_i + u_{it}.$$

Where, $Q_\tau(u_{it}|x_{it}) = 0$.

The problem of incidental parameters appears if the fixed effects are estimated (Koenker, 2005; Wooldridge, 2002). This is particularly serious when there are a large number of fixed effects due to a large number of countries or units—leading to parameters being inconsistently estimated (Koenker, 2005; Wooldridge, 2002). The literature suggests the following approaches around the problem. One way, is by using the Chamberlain/Mundlak correlated random effects approach. This helps in reducing the problem of estimating several fixed effects. The unobserved effects are estimated in terms of the averages of the time varying explanatory variables.

$$c_i = \psi_0 + \bar{x}_i\xi_0 + a_i;\; y_{it} = \psi_0 + x_{it}\theta + \bar{x}_i\xi_0 + \upsilon_{it}$$

where $\upsilon_{it} = a_i + u_{it}$, the composite error term. A variation of this is also presented by Abrevaya and Dahl (2008) for two time periods. For the Chamberlain/Mundlak approach we need to impose an independence assumption that is υ_{it} is independent of the x's. This requires strong independence assumptions to identify the parameters of interest (Wooldridge, 2002). Which Wooldridge (2002) notes that, it implies parallel quantile functions. Two other approaches discussed by Wooldridge (2002) include estimations using time demeaned data $\ddot{y}_{it} = \ddot{x}_{it}\theta_0 + \ddot{u}_{it}$. A pooled quantile regression can also be estimated on differenced data, that is $\Delta y_{it} = \Delta x_{it}\theta_0 + \Delta u_{it}$. The differenced data removes the unobserved component c_i just as the the time-demeaned regression does. Doing this, thus allows the regression to be estimated without having to worry about the fixed effects and the problems of incidental parameters that it gives rise to (Wooldridge, 2002). A fourth approach, is the penalized fixed effects estimator of Koenker (2004, 2005) which attempts at resolving the issue with panel data by adding an additional parameter in the regression that serves as a penalty by reducing the parameter estimates. In the Koenker approach the fixed effects are estimated, however, the inconsistency they add to the parameter estimates are offset by the penalty parameter incorporated in the regression. We however, adopt the Chamberlain/Mundlak correlated RE framework advocated in Wooldridge (2002) for our analysis.

The following two equations are estimated for the cross-section and panel data respectively.

$$Q_\tau(y_i|x_i) = \alpha_\tau^{cs} + \beta_\tau^{cs} AGOA_i + x_i\gamma_\tau^{cs} + \xi_\tau^{cs} + \epsilon_{it} \tag{1}$$

$$Q_\tau(y_{it}|x_{it}) = \alpha_\tau^{p} + \beta_\tau^{p} AGOA_{it} + x_{it}\gamma_\tau^{p} + \bar{x}_{it}\xi_\tau^{p} + \eta_t + \upsilon_{it} \tag{2}$$

Where $\upsilon_{it} = a_i + \varepsilon_{it}$, $Q_\tau(\epsilon_i|x_i) = 0$, $Q_\tau(\upsilon_{it}|x_{it}) = 0$, $\tau \in (0.25, 0.50, 0.75, 0.95)$ and is to show that the estimated coefficients are for different quantiles. p and cs are for pooled and cross-section respectively.

The quantile estimations are motivated by the gravity model which is one of the standard tools in the empirical trade literature [7] Equation (1) is the first of our structural quantile estimating equations for the cross-section. The controls include gravity type variables namely, dummies for english, spanish and landlocked, the logs of distance, area, population and GDP. Equation (2) on the other hand, represents our estimating equation for the panel data. The same covariates used in equation (1) are used in the panel case. These are then augmented with the means of the time varying covariates for each country i as well as time effects (η_t) to account for changes in preferences offered and market demand shocks. Additionally, using the structural quantile estimation allows for a simple test of the equality of the coefficients across the various quantiles. That is, the null hypothesis $\beta_{0.25}^{cs} = \beta_{0.50}^{cs} = \beta_{0.75}^{cs} = \beta_{0.95}^{cs}$ and $\beta_{0.25}^{p} = \beta_{0.50}^{p} = \beta_{0.75}^{p} = \beta_{0.95}^{p}$ are tested for the cross-section and panel respectively. A rejection of the null hypothesis implies that the effects of the preference vary across the various quantiles estimated.

[7] Cipollina and Salvatici (2010a) conducts a meta-analysis of several studies that have employed gravity models on studying reciprocal trade agreements. This is a small subset of the larger literature using gravity models. The literature has used gravity models for several areas, such as studies on foreign direct investment, transport costs, migration, free trade agreements, regional trade agreements and the impact of disasters on trade among several other areas in the trade literature. Cardamone (2007) is another survey of gravity models in the area of preferential trade agreements. In addition, Anderson (1979); Anderson and van Wincoop (2003); Anderson and Yotov (2012); Baier and Bergstrand (2009); Baldwin and Taglioni (2006); Chaney (2008); Helpman et al. (2007); Silva and Tenreyro (2006); Westerlund and Wilhelmsson (2009) and a few others are studies that discuss the methodological and theoretical issues involved with gravity equations.

4.2 Data

Data is obtained from several sources. Data for the outcomes are obtained from the UN-Comtrade database. The World Development Indicators and IMFs International Financial Statistics databases provide macroeconomic indicators (such as, gross domestic product, inflation, population, value-added (in industry, manufacturing, agriculture, construction, services, etc), interest rates, exchange rates among others) for the purposes of matching similar countries. Additionally, Kaufmann's Global Governance[8], Database of Political Institutions[9], Polity IV and Bates et al (2005)[10] databases provide political, cultural and religious data to augment the vector of control variables needed to perform a realistic match. Finally, gravity type variables are obtained from the CEPII gravity database [11].

A panel of 35 treated countries from SSA and some 130 control countries (developing countries in Asia, Latin America and the Caribbean as well as North Africa) for the years 1991 – 2010 is employed in the study. After matching the number of control countries included in the estimation drops to 40 countries—giving us a total of 75 countries for the matching estimators. Table (10) in the appendix shows the number of treated and control countries falling within each block of the propensity score as well as the overall number of treated and control countries matched.

5 Results and Discussion

To motivate the choice of the quantile regression we show the distribution of the three outcome variables used in the analysis. The kernel density estimates in figure (4) shows the differences in the distribution of exports for *agoa*, *non-agoa* and *Caribbean Basin Trade Protection (cbtpa)*[12] exporters. The *cbtpa* exporters are shown seperately since they have similar tariff preferences as the *agoa* recipients. Thus, in the analysis in the next sections, they are excluded from the control group of countries to allow the impact of the *agoa* preference on the African countries to be identified at the estimated quantiles of interest. Figure (5) provides the quantile plots for the outcome variables for *agoa* and *non-agoa* countries. The diagonal solid line is a reference line indicating points of symmetry for a distribution. Given that, in all the graphs, the points of the outcome variable lie off the reference line, it can be concluded that the distributions are heavily skewed. The *non-agoa* outcomes are skewed to the left.

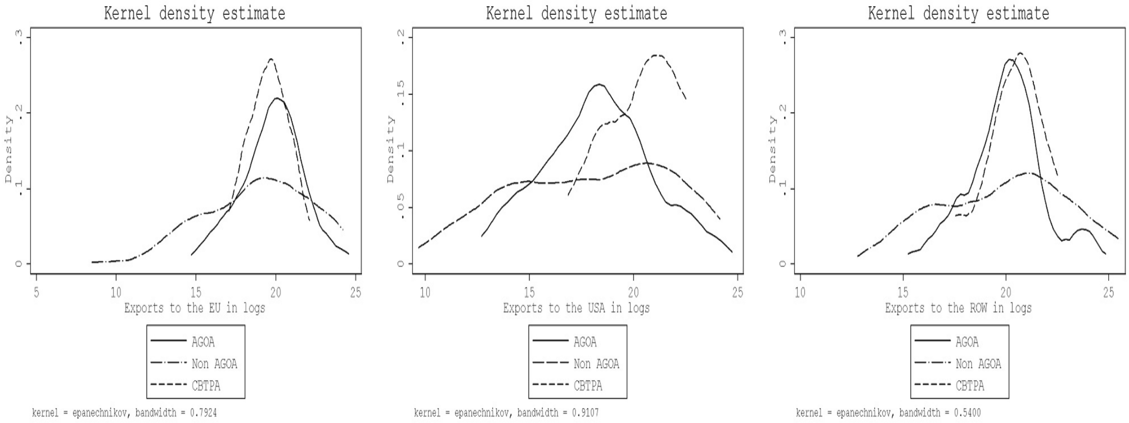
[8] www.worldbank.org/wbi/governance/

[9] Thorsten Beck, George Clarke, Alberto Groff, Philip Keefer, and Patrick Walsh, 2001. "New tools in comparative political economy: The Database of Political Institutions." 15:1, 165-176 (September), World Bank Economic Review.

[10] Robert Bates ; Karen Feree; James Habyarimana; Macartan Humphreys ; Smita Singh, "Other Political Data (updated 2005)", http://hdl.handle.net/1902.1/14977 UNF:5:XzsUmjt4AZzpm9JB3hO6pA== Murray Research Archive [Distributor] V1 [Version]

[11] http://www.cepii.fr/anglaisgraph/bdd/gravity.asp

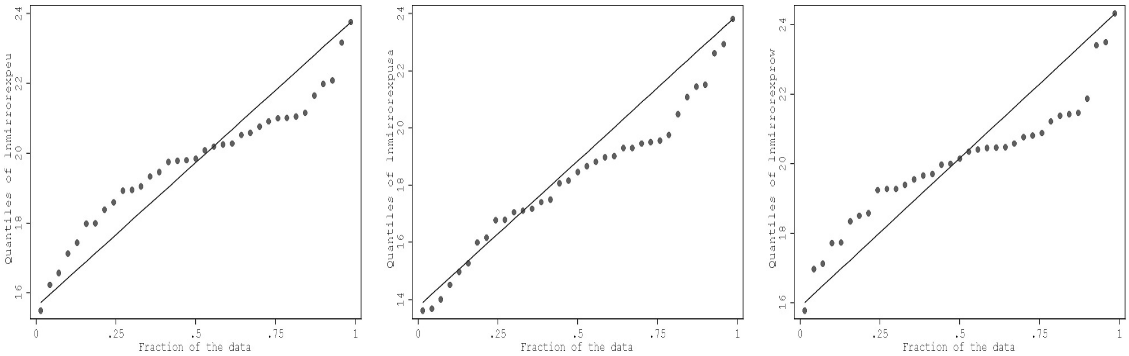
[12] These are mainly countries in the Caribbean Basin region. We also exclude Central American countries, Dominican Republic and Mexico since they have a free trade agreement with the USA.



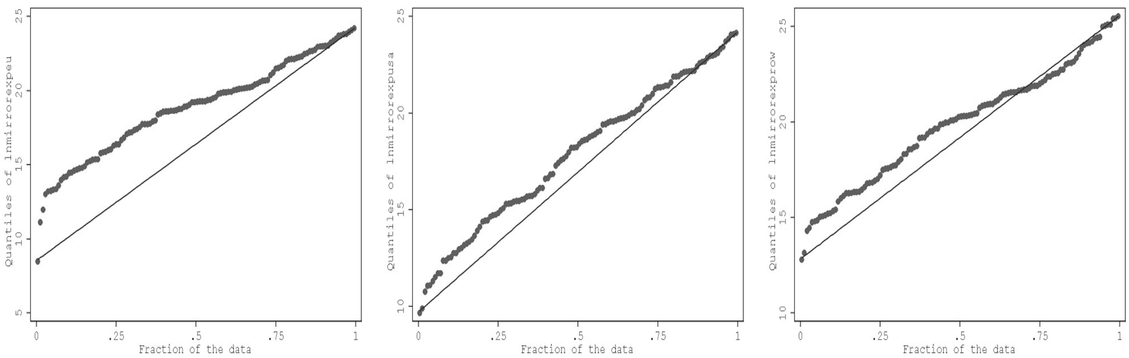
(a) Exports to the EU (b) Exports to the USA (c) Exports to ROW

Source: Author's elaboration based on the UN Comtrade database.

Figure 4: *Kernel Density estimates of exports, by preference*



(a) Exports to EU–AGOA (b) Exports to USA–AGOA (c) Exports to ROW–AGOA



(d) Exports to EU–Non-AGOA (e) Exports to USA–Non-AGOA (f) Exports to ROW–Non-AGOA

Source: Author's elaboration based on the UN Comtrade database.

Figure 5: *Quantiles plots of exports: AGOA and Non-AGOA countries*

5.1 Cross-section results

Tables (2 & 3) report the quantile estimates for the cross-section[13]. The first table is based on the common support sample obtained from our propensity score estimation in the previous section. On the other hand, the second table is based on our full sample including the set of countries not on common support. In both tables, we observe varying effects of the treatment across various percentiles of the distribution of our outcomes. Incorporating a vector of control variables does not improve upon the significance of our estimates. The first three columns of both tables are estimated with the treatment as the only explanatory variables. The last three columns on the other hand, have GDP, population, area, English dummy, Spanish dummy (reference category other languages), landlocked dummy, and distance as additional control variables.

In table (2), the impact of *agoa* is significant and negative at the 75th percentile for all three destinations. There is no impact at the other percentiles estimated for the first three columns. Thus at the 75th percentile *agoa* countries export less to all three destinations relative to the control countries all other things equal. Upon adding our additional covariates, the impacts at the 75th percentile for USA and EU are no longer significant. However, the negative impact for ROW is maintained but, the magnitude is lower (-0.926). Additionally, at the median we observe that *agoa* countries export 67.4% less exports compared to the control countries and this is significant at the 5% level of significance.

Table (3), has all three columns reporting significant estimates for the 25th percentile. After including other control countries we find a positive impact at the 25th percentile to all three destinations for the first three columns. Again, there is a negative and significant estimate at the 75th percentile for exports to the USA and ROW. All remaining percentiles of the first three columns report no significant estimates. Like the previous table incorporating our additional covariates leads to all estimates across the percentiles for exports to the USA and EU becoming insignificant. However, the median and 75th percentile estimates of the impact on exports to ROW remain significant and negative[14].

[13] A propensity score is estimated based on a logit estimation of whether a country receives the *agoa* preference. Tables showing the logit results, post-estimation tests and graphs of common support are included in the appendix for those interested. The matched sample is based on the model in the first column of table (9) and includes both control and treated countries falling within the region of common support. The full sample includes the remaining countries that lie outside the region of common support. A list of the countries is also presented in the appendix. For the panel data analysis the propensity score is estimated for each year separately.

[14] For robustness purposes, the log differences in the dependent variable for 2002, 2005 and 2010 with the base year 1997 (that is, 2002–1997; 2005–1997 and 2010–1997) were estimated but are not shown in the paper. Similar to the results above, the log differenced results were not significant in most cases for the common support sample. On the contrary, including the other control countries led to significantly negative estimates for the EU at the median, 75th and 95th percentiles for the 2005 and 2010 differences. The coefficients were negative and significant for *agoa* at the median and 25 percentiles for the 2002 difference. ROW surprisingly showed positive and significant coefficients at the median and 25th percentile for the 2010 difference—indicating a higher rate of increase in exports between the two periods in favour of the treated countries (relative to the controls). This is quite similar to the positive impact seen in table (3) above. The coefficient in this case is 0.518 (25th) and 0.425 (50th) which as expected are smaller than the coefficient of 2.022 (25th) reported above. The positive impact is attributed to the fact that, 2010 was the height of the financial crisis and thus, *agoa* exporters had to find other markets to absorb the exports due to the reduced demand in the US and EU markets. Nonetheless, this positive impact is at the lower end of the export distribution and is not

Table 2: Quantile regression estimates for exports to the EU, USA and ROW

	(1) EU	(2) USA	(3) ROW	(4) EU	(5) USA	(6) ROW
q25						
AGOA Treatment	0.865	1.218	-0.257	0.493	0.00349	-0.755
	(0.814)	(1.321)	(0.838)	(0.434)	(0.763)	(0.572)
Constant	17.72***	15.56***	19.49***	5.452*	6.354+	9.284***
	(0.610)	(1.077)	(0.671)	(2.575)	(3.202)	(1.479)
q50						
AGOA Treatment	-0.219	-0.315	-0.919	0.584	0.137	-0.674*
	(0.868)	(0.970)	(0.576)	(0.398)	(0.641)	(0.291)
Constant	20.07***	18.77***	21.06***	8.355***	7.509*	10.61***
	(0.800)	(0.755)	(0.479)	(2.145)	(2.840)	(1.646)
q75						
AGOA Treatment	-1.932**	-2.325*	-1.845*	0.158	-0.0630	-0.926*
	(0.629)	(0.929)	(0.774)	(0.478)	(0.932)	(0.378)
Constant	22.94***	21.88***	22.73***	9.392***	9.429**	10.41***
	(0.517)	(0.658)	(0.681)	(1.825)	(3.360)	(2.039)
q95						
AGOA Treatment	-0.782	-0.775	-1.499	-0.632	0.980	-0.412
	(0.837)	(0.958)	(1.018)	(0.497)	(0.896)	(0.442)
Constant	23.95***	23.71***	24.99***	13.45***	15.27***	10.68**
	(0.256)	(0.427)	(0.415)	(2.149)	(3.550)	(3.122)
Controls	No	No	No	Yes	Yes	Yes
Observations	75	75	75	74	74	74

Standard errors in parentheses Bootstrapped standard errors with 500 replications in parenthesis. Dependent variables is exports Quantiles selected are .25, .50 & .75. Controls include: English, Spanish & landlocked dummies, logs of distance, area, population & gdp

$^{+}$ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

observed at the top 25% – 5%.

Table 3: Quantile regression estimates for exports to the EU, USA and ROW: Full sample

	(1) EU	(2) USA	(3) ROW	(4) EU	(5) USA	(6) ROW
q25						
AGOA Treatment	2.233*	1.952*	2.022**	0.570	-0.00848	-0.588
	(0.866)	(0.825)	(0.688)	(0.409)	(0.621)	(0.480)
Constant	16.35***	14.83***	17.21***	5.300**	7.982**	9.063***
	(0.647)	(0.449)	(0.501)	(1.796)	(2.401)	(1.234)
q50						
AGOA Treatment	0.636	0.230	-0.107	0.376	-0.131	-0.610*
	(0.476)	(0.842)	(0.440)	(0.329)	(0.533)	(0.252)
Constant	19.21***	18.23***	20.25***	10.19***	9.493***	8.776***
	(0.334)	(0.605)	(0.313)	(1.507)	(1.856)	(1.440)
q75						
AGOA Treatment	-0.472	-1.767*	-1.100*	0.0486	-0.580	-0.670+
	(0.698)	(0.793)	(0.492)	(0.345)	(0.877)	(0.397)
Constant	21.48***	21.32***	21.98***	10.74***	11.09***	9.653***
	(0.621)	(0.515)	(0.336)	(1.846)	(1.870)	(1.545)
q95						
AGOA Treatment	-0.522	-0.375	-1.499	-0.388	0.915	-0.321
	(0.912)	(0.949)	(0.992)	(0.345)	(0.687)	(0.492)
Constant	23.69***	23.31***	24.99***	13.84***	15.18***	13.15***
	(0.283)	(0.347)	(0.380)	(1.982)	(2.520)	(2.698)
Controls	No	No	No	Yes	Yes	Yes
Observations	157	157	157	128	128	128

Standard errors in parentheses. Bootstrapped standard errors with 500 replications in parenthesis. Dependent variables is exports Quantiles selected are .25, .50 & .75. Controls include: English, Spanish & landlocked dummies, logs of distance, area, population & gdp

$^{+}$ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figures (9 & 10) summarise our quantile estimates. The formal tests of the equality of the estimated impact across the percentiles are also reported in the appendix (see table 12). For the case where no controls were included in the regression the three outcomes report significant F-tests indicating that the estimated impact differs across the distribution. The same cannot be said of the impact after including our controls, we are unable to reject the equality of the impact across the four percentiles. In figures (9 – 11), the long-dashed line represents the quantile regression coefficients and this is drawn within two dotted-lines that represent the 95% confidence interval. The OLS coefficient is also plotted as the continuous horizontal line for comparative purposes. It is also drawn between two dotted-lines representing the 95% confidence interval. In figure (9), the sub-figures (a), (b) and (d) show the quantile estimates going beyond the OLS confidence interval. This indicates that there are differences across the quantiles and that the impact is not the same across all the quantiles estimated. The remaining sub-figures (c, e & f) lie within the OLS confidence intervals—implying that, the effect is similar across the quantiles estimated. Figure (10) shows similar results, however, sub-figure (c) now lies outside the OLS confidence interval at both ends of the distribution.

5.2 Decomposition of quantile impact

Figure (6) and (7) show the decompositions carried out according to Machado and Mata (2005) and Melly (2005). Machado and Mata (2005) have extended the Oaxaca-Blinder decomposition to quantile regressions [15]. Machado and Mata (2005) decompose the wage density into changes due to coefficients, covariates and the residual. These three terms explain the differences in the wage densities of the two groups identified[16]. Melly's (2006) decomposition of the difference between a treated and untreated group at the θ^{th} quantile of the unconditional distribution is given by:

$$\hat{q}_1(\theta) - \hat{q}_0 = [\hat{q}_1(\theta) - \hat{q}_c(\theta)] + [\hat{q}_c(\theta) - \hat{q}_0(\theta)],$$

where the $\hat{q}_0, \hat{q}_1$ are the quantiles estimated for the control and treated groups respectively and $\hat{q}_c$ is the counter-factual quantile distribution. The initial term in brackets provide the effect of coefficients on the gap between the treated and counter-factual controls. The second term is due to the effect of differences in their covariates[17,18]

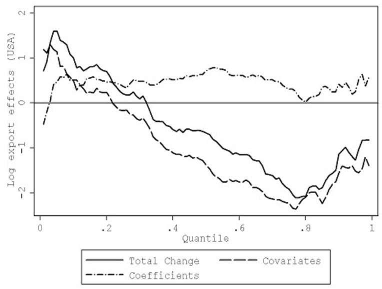
In figure (6) the effect of the covariates and coefficients exert similar impacts on the export gap between the *agoa* and *non-agoa* countries. The contribution of the effects of the covariates and coefficients are larger at the tails of the distribution. The total change is mostly positive for exports to the USA and EU. On the contrary, the export gap for exports to ROW is negative at all quantiles. Figure (7) shows only the effect of the coefficients together with the 95% confidence interval. The difference in the impact of the coefficients in the matched sample and full sample is now more evident. For the USA, there is an increasing trend observed in the coefficients at the top 20% of the distribution. In the bottom 5%, although there is a sharp increase in the effect—this, stabilises in the mid-region of the distribution. The EU on the other hand, shows a declining effect of the coefficients at the top 30% with a steep increase at the tail of the distribution. A fairly flat effect of the coefficients is shown for the exports to ROW. Based on the graphs above, the observed impacts at the various quantiles are driven by a differing combination of coefficient and covariate effects. The effects are generally not homogeneous and differ depending on which part of the export distribution is analysed. In the decomposition literature cited above, the coefficient effect is normally interpreted as a price effect. However, in our case, we do need to control for quota restrictions, rules of origin, transport costs and other unobserved factors that influence the amount of exports by these groups. Clearly, delineating these would help in identifying the price effect more clearly and to attribute the coefficient gap to the price differential resulting from clearly higher prices received by *agoa* exporters due to the lower tariffs relative to the control countries.

[15] A variant of this decomposition is described in Melly (2005) and Melly (2006). Melly provides the *rqdeco* stata command to implement the decomposition. For more technical details and a complete description of the decomposition, see Machado and Mata (2005); Melly (2005, 2006).

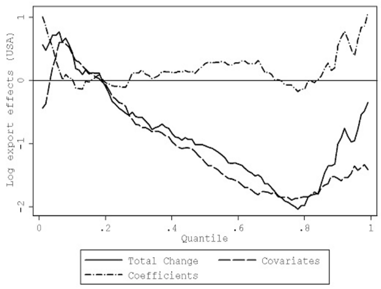
[16] In this case, the decomposition was for the raw wage gap between men and women.

[17] Melly (2006) shows that the first term gives the quantile treatment effect on the treated. Fortin et al. (2010) is another paper showing the similarity of the decomposition to the effects in the treatment literature.

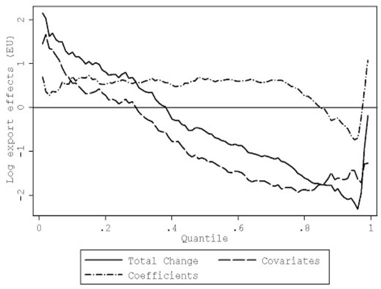
[18] The decomposition by Melly (2006) and Melly (2005) is numerically identical to Machado and Mata's (2005) estimator. As Machado and Mata's (2005) simulations approach infinity identical results are obtained (Melly, 2006).



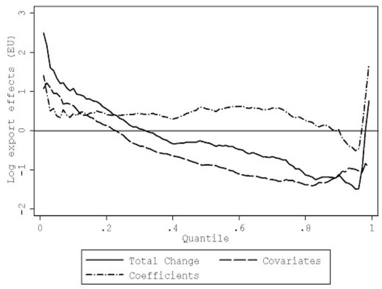
(a) USA (Matched sample)



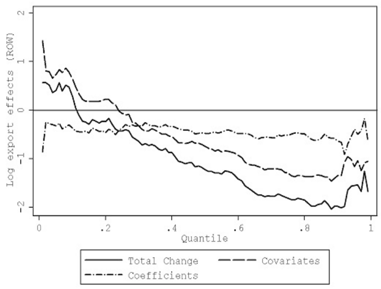
(b) USA (full)



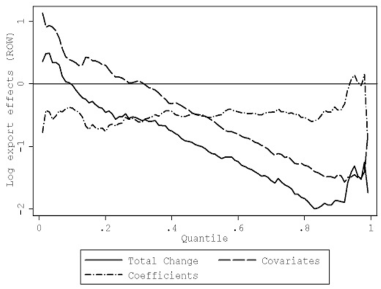
(c) EU (Matched Sample)



(d) EU (full)



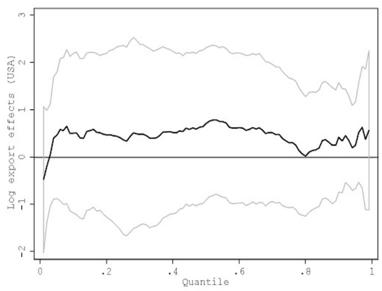
(e) ROW (Matched sample)



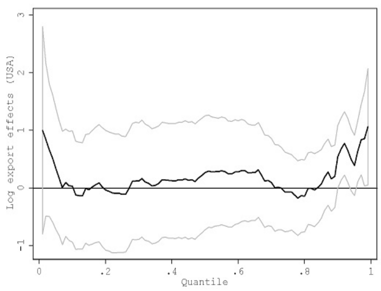
(f) ROW (full)

Decomposition based on the estimation of 99 quantiles with a 100 bootstrapped replications for the standard error. Covariates used in the decomposition include area, gross domestic product, population, landlocked, and distance. Total change refers to the raw export gap between *agoa* and *non-agoa* countries. Covariates is the difference due to the covariates and coefficients is the difference due to the coefficients estimated. The matched sample refers to the sample of countries that were matched and fall within the area of common support. The full sample refers to all the countries included in the dataset. A horizontal line at zero is added to show the positive and negative changes more clearly.

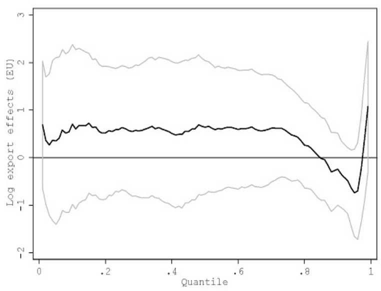
Figure 6: *Decomposition of differences in the distribution of exports*



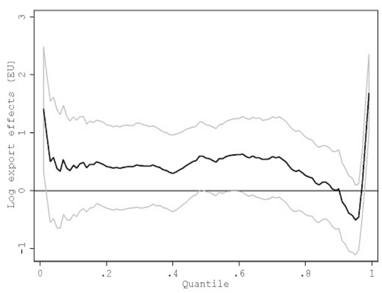
(a) USA (Matched sample)



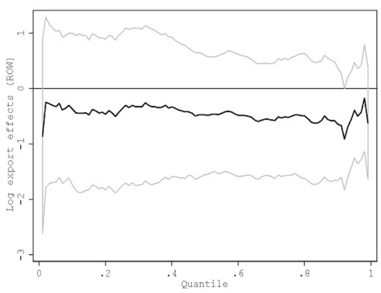
(b) USA (full)



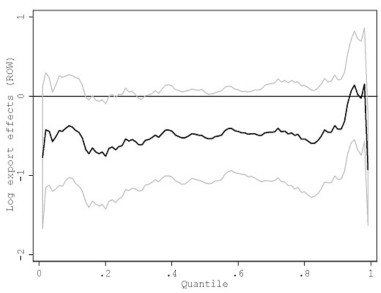
(c) EU (Matched sample)



(d) EU (full)



(e) ROW (Matched sample)



(f) ROW (full)

The graphs shown are based on the estimation of 99 quantiles with a 100 bootstrapped replications for standard errors. The matched sample refers to the sample of countries that were matched and fall within the area of common support. The full sample refers to all the countries included in the dataset. The continuous dark line is the effect of the coefficient and the grey line enclosing the effect is the 95% confidence interval. A horizontal line at zero is added to show the positive and negative changes more clearly.

Figure 7: *Effect of estimated coefficients on export difference*

5.2.1 Panel data

The estimates reported in this section are for our panel regressions. The panel version reports more significant estimates. The incorporation of more variation by having a time dimension has significantly improved our results. In addition, we include dummies for each year to capture changes in demand and also changes in the *agoa* preferences over time in all columns. Additionally, we add the time averages of the time varying variables to capture elements of the fixed effects regression in all columns. In tables (4 & 5) the first three columns include the full set of controls, year effects, and the averages of the time varying variables. The final three columns on the other hand, excludes the set of controls but includes the year effects and the averages of the time varying variables. In table (4), exports to the EU are positive and significant at the 25th percentile and the median in both columns (1) and (4). The 75th percentile is also positive and significant in column (4) while the 95th percentile is negative and significant in column (1).

In terms of exports to the USA there is a positive and significant impact of *agoa* at the 95th percentile in both columns (1 & 2). At the median a positive impact is also observed in column (5) which is significant at 10%. Exports to ROW also shows significant and negative coefficients for the treatment for all percentiles estimated in both columns (3) and (6). The decline varies from 31.9% to 70.1%, indicating that *agoa* recipients exported 31.9% – 70.1% less exports to ROW than the control countries. A casual observation of the coefficients shows that in column (3), the largest decline is at the median while in column (6) the largest decline is at the 75th percentile. In both columns we observe that the impact is different across the various percentiles. Formal tests of this hypothesis (in the appendix, see table 13) indicates that the coefficients are statistically different in column (3) but we cannot reject any difference between the coefficients in column (6) given our F-tests of 2.584 and 1.346 respectively. We also find the impact to be statistically different for exports to the EU at 5% (15.814 and 9.936 for columns 1 and 4 respectively). An implication of the result is that much of the increase in exports to the EU relative to the control countries occurs at the bottom 25% and the median of the distribution of the dependent variable. Adding the set of controls yields marginally smaller impacts. Thus for exports to the EU, *agoa* countries export 29.1% – 79.1% more exports than the control.

On the contrary, exports to the USA are positive and significant at the 95th percentile. this is quite opposite to the impact of exports to the EU. At the 95th percentile *agoa* countries export 57.4% – 65.8% more to the USA relative to the control countries. We find no significant estimates at the other percentiles estimated (except at the median in column 5 which reports a 33.4% increase relative to the control countries at the 10% level of significance).

Finally, table (5) shows the results for all countries including those not on common support. The results are similar to the previous table. The notable differences are the negative and significant decline in column (5) for exports to the USA at the 50th and 75th percentiles. Also, in column (4) the impact at the 95th percentile is now significant. A third observation is that, the positive coefficients are now larger in the second table (with the exception of column (5) where the coefficient falls from

0.658 to 0.453 in the second table at the 95th percentile). Additionally, all the negative impacts are also smaller in magnitude and include a few cases where significant estimates are no longer significant. These results imply that having a larger number of countries that are dissimilar from the preference recipients tends to exaggerate both the positive and negative impacts—positive impacts become larger while the negative impacts become smaller in magnitude.

Figures (12 & 11)) provide a graphical summary of our coefficients. The figure provides evidence that the quantile estimates are similar for exports to ROW in the case where there are no control variables. On the other hand, the exports to the EU and USA are different as depicted in the graph in both figures. Moreover, the inclusion of control variables pushes the impact at the top 25% further away from the OLS coefficient. Again, an indicator that, the impact at the top 25% is large and different from the other quantiles of interest.

Table 4: Structural quantile estimates of exports

	(1) EU	(2) USA	(3) ROW	(4) EU	(5) USA	(6) ROW
q25						
AGOA Treatment	0.599***	-0.132	-0.552*	0.791***	0.158	-0.319*
	(0.175)	(0.194)	(0.215)	(0.123)	(0.197)	(0.151)
Constant	-4.575	-16.44**	1.927	7.982***	2.930***	9.519***
	(3.541)	(5.355)	(2.646)	(0.503)	(0.690)	(0.626)
q50						
AGOA Treatment	0.453**	0.243	-0.701***	0.589***	0.334+	-0.349***
	(0.142)	(0.222)	(0.089)	(0.110)	(0.190)	(0.100)
Constant	-0.979	-18.54***	3.185	8.829***	4.745***	11.89***
	(2.908)	(5.086)	(2.715)	(0.558)	(0.762)	(0.456)
q75						
AGOA Treatment	0.0459	0.0317	-0.514***	0.291**	0.135	-0.554***
	(0.190)	(0.271)	(0.111)	(0.099)	(0.261)	(0.097)
Constant	4.473	-30.69***	-8.525*	10.34***	8.181***	12.36***
	(2.896)	(8.013)	(3.314)	(0.507)	(1.051)	(0.364)
q95						
AGOA Treatment	-0.692***	0.574**	-0.359**	-0.345	0.658***	-0.528*
	(0.146)	(0.198)	(0.117)	(0.210)	(0.176)	(0.218)
Constant	6.510*	-11.43	-19.24***	14.64***	13.04***	13.38***
	(3.154)	(9.152)	(3.856)	(1.187)	(0.538)	(0.731)
Controls	Yes	Yes	Yes	No	No	No
Year	Yes	Yes	Yes	Yes	Yes	Yes
Mundlak	Yes	Yes	Yes	Yes	Yes	Yes
Observations	721	718	718	740	737	737
Countries	72	72	72	74	74	74

Standard errors in parentheses. Bootstrapped standard errors with 500 replications in parenthesis. Dependent variables is exports. Controls include: English, Spanish & landlocked dummies, logs of distance, area, population & gdp

$^{+}\ p < 0.1$, $^{*}\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Table 5: Structural quantile estimates of exports: All countries

	(1) EU	(2) USA	(3) ROW	(4) EU	(5) USA	(6) ROW
q25						
AGOA Treatment	0.419**	-0.228	-0.933***	0.867***	-0.212	-0.346**
	(0.128)	(0.199)	(0.178)	(0.113)	(0.190)	(0.125)
Constant	7.615***	12.21***	2.807*	7.772***	3.090***	9.705***
	(1.909)	(1.844)	(1.376)	(0.484)	(0.645)	(0.554)
q50						
AGOA Treatment	0.362*	-0.295	-0.684***	0.607***	-0.379*	-0.353***
	(0.147)	(0.184)	(0.077)	(0.109)	(0.187)	(0.094)
Constant	9.026***	16.25***	3.965***	9.188***	5.412***	12.19***
	(1.544)	(1.711)	(0.915)	(0.566)	(0.912)	(0.401)
q75						
AGOA Treatment	-0.0713	0.0377	-0.663***	0.343***	-0.696**	-0.420***
	(0.101)	(0.290)	(0.105)	(0.103)	(0.258)	(0.096)
Constant	5.270***	14.07***	4.284***	10.76***	9.167***	12.65***
	(1.572)	(1.492)	(0.966)	(0.512)	(1.056)	(0.372)
q95						
AGOA Treatment	-0.603***	0.716***	-0.483***	-0.314*	0.453***	-0.388+
	(0.124)	(0.135)	(0.113)	(0.125)	(0.105)	(0.207)
Constant	3.780	17.80***	0.772	15.49***	13.48***	14.92***
	(2.410)	(2.583)	(2.053)	(0.824)	(0.280)	(0.856)
Controls	Yes	Yes	Yes	No	No	No
Year	Yes	Yes	Yes	Yes	Yes	Yes
Mundlak	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1050	1047	1047	1080	1076	1076
Countries	105	105	105	108	108	108

Standard errors in parentheses. Bootstrapped standard errors with 500 replications in parenthesis. Dependent variables is exports. Controls include: English, Spanish & landlocked dummies, logs of distance, area, population & gdp

$^{+}$ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5.3 General discussion

The evidence presented above for exports to the EU and USA indicate that the impact of *agoa* has been heterogeneous. This is supported by the graphs provided in section (5.2) which show remarkably different impacts at the tails of the distribution. The increase in the absolute value of the impact as one moves for the bottom 10% to the top 10% supports this notion of heterogeneity. This might explain why the literature presents mixed results on the impact of *agoa* on exports to the USA. The impact on exports to the USA is mainly at the top 5% and therefore is more likely to lead to impacts larger than 2. Nonetheless, the choice of countries used in the analysis plays a key role in determining the direction and size of the impact. This is supported by the decomposition of the impact carried out in section (5.2). The graphs show the differential impact of both the coefficients of *agoa* and *non-agoa* countries as well as the covariates in explaining the total impact[19] of the preference.

The role of economic growth, closeness to the export markets, land area, landlocked, and

[19]As the reader might have observed the words *impact* and *gap* have been used interchangeably throughout the text. In the analysis our use of the word *export gap* also refers to the impact of *agoa* although technically speaking they differ.

population in determining the total impact cannot be overemphasised. These variables are however, more prominent in explaining the export gap for the EU and USA markets. This was observed earlier as the sharp increase in the effects at the higher quantiles as well as the positive difference but declining trend at the lower quantiles. These two parts of the covariate and coefficient effects tend to make the total change for the two destinations positive over a wide range of quantiles. On the contrary, although the impacts of the coefficients and covariates look similar they start from a lower difference compared to the EU and USA cases. Besides the rapid turnaround in the declining differences at the higher quantiles is not as steep or rapid as is the case for the EU and USA markets. We therefore fail to observe the total change being pushed to a positive gap in the case of exports to ROW.

All the foregoing supports the notion that the gains in the EU and USA markets have been counteracted by reductions in exports at other destinations. Exports to ROW has suffered more as a result of the competing preferences of the EU and USA. Although, not obvious from the quantile analysis there have been such effects between the EU and USA markets in relative terms. Thus, we observe *agoa* recipients having relatively higher exports to the EU and USA markets compared to *non-agoa* recipients. The differences are also observed at specific parts of the distribution of exports. Moreover, for both markets the positive impact of the preference is observed at the tails of the distribution. The bottom 25% and median are mainly where we find a positive impact on exports to the EU. The positive impact on exports to the USA is at the top 5% of exports. Our interpretation of this, is that, for countries finding themselves at bottom of the distribution, *agoa* has not reduced their exports to the EU. On the other hand, countries at the top of the distribution have successfully increased their exports to the USA but have been unable to sustain any increases in their exports to the EU Exports to the EU have rather decreased for the *agoa* relative to the *non-agoa* countries, as can be gleaned from tables (4 & 5). Now, this effect observed at these quantiles are relative to the control group of countries and inform us about the nature of competition among the countries falling within the tails of the distribution[20].

In spite of the relatively higher exports to the EU and USA markets, the evidence points overwhelmingly to a poor export performance relative to *non-agoa* countries in exports to ROW. The result supports the emphasis African countries place on finding European and American markets for their exports to the detriment of their neighbouring countries and other destinations outside the EU and USA. One might be tempted to associate the inflexible rules of origin[21] which makes it less favourable for African countries to source inputs from certain regions and countries. Nonetheless, the similarity in resources and hence exports might also be a contributing factor that explains the poor export performance in the ROW market.

The short-run switching of markets is more evident in the trends in shares of the top 5 *agoa*

[20] A more detailed exercise of the nature and composition of *agoa* and *non-agoa* countries in the tails is not carried out here, it is left out to be presented in a yet to be completed paper.

[21] On this a number of studies have examined rules of origin pertaining to various preferences. Examples include, Brenton and Manchin (2003); Bureau et al. (2007); Carrere et al. (2011); Mattoo et al. (2003). Mattoo et al. (2003) in particular focusses mainly on *agoa* rules of origin.

exporters to the USA presented in section (3). These show for the individual countries that in some cases there have been non-linear effects on the shares. In addition, the evidence that, increasing exports to one destination has decreasing effects on exports to other destinations is supported by the five sub-figures. In concluding it must be noted that the usual *ceteris paribus* caveats apply and the impacts discussed are relative to the control group of countries (*non-agoa*). However, the control group of countries are supposed to serve as a counter-factual to our *agoa* countries in terms of how their exports would have fared in the absence of the preference. Hence, our conclusions about the impact for *agoa* countries can be discussed in terms of what is happening to exports of the recipients of the preferences.

6 Conclusion

Quantile regressions are estimated in this paper to show the heterogeneous impact of the *agoa* preference on exports of recipients to the EU, ROW and USA. The results do indicate that much of the impact on exports to the EU and USA has occurred at the tails of the export distribution. The coefficients estimated at the quantiles of interest are found to be different across the estimated quantiles. Thereby indicating the presence of heterogeneity of the impact of the preferences on the outcomes to the EU and USA. There is less heterogeneity in exports to ROW. This is corroborated by our graphical analysis that finds our estimated coefficients to be within the confidence bounds of the mean estimated coefficient.

Exports to the EU have a positive impact at the median and bottom 25% while for the USA the positive impact is observed at the top 5%. Nevertheless, using a larger set of countries tends to exaggerate the impact of *agoa* on their exports. Positive impacts are made larger while the magnitude of the negative impacts become lower with the additional set of countries. The lessons from this study is that, in studying the impact of trade preferences (also other preferential trading arrangements) it is important to bear in mind the similarity of the countries being compared in the analysis. Bundling all countries in a regression to study the impact might yield estimates that have been amplified.

Despite the performance in the EU and USA markets the evidence points overwhelmingly to a poor export performance relative to *non-agoa* countries in exports to ROW. The result supports the emphasis African countries place on finding European and American markets for their exports to the detriment of their neighbouring countries and other destinations outside the EU and USA. One might be tempted to associate the inflexible rules of origin which makes it less favourable for African countries to source inputs from certain regions and countries. Nonetheless, the similarity in resources and hence exports might also be a contributing factor explaining the poor export performance in the ROW market.

The current paper extends the *agoa* impact literature by carrying out a decomposition of the export gap between *agoa* and *non-agoa* recipients. Nonetheless, a second contribution is the use of the quantile regression framework to show the heterogeneous impact of *agoa* on recipients.

Decomposition methods although widely used in wage gap studies have not been as popular in the *agoa* preference literature[22]. The decomposition indicates that, much of the differences between *agoa* and *non-agoa* recipients are mainly due to coefficient and covariate differences that reinforce the export gap between the two groups.

To conclude, we note that, there are a few caveats to this paper. First, the increase/decrease in impact shown in the estimations are in comparison to the control countries and do not imply an increase/decrease in absolute exports by each *agoa* country. Rather, they imply that in comparison to a set of countries similar to them they exported more/less comparatively. Secondly, this is arguably an initial attempt to explore what is happening to exports of *agoa* recipients to other export destinations. And thus, our framework requires more work to strengthen our conclusions as well as improve our causal framework. Particularly, we do need to explore other ways of obtaining robust estimates for our quantile estimates based on the panel of countries. Last but not the least, it would be useful to revisit the decomposition exercise to control for more covariates as well as identify whether the decomposition has been influenced by unobserved factors. In this regard, researchers can again draw upon existing studies in the labour field employing selection methods to control for unobserved factors and endogeniety. These are areas of interest that can be explored in future work.

[22] A notable exception is Tadesse and Fayissa (2008) who does a different decomposition which is more in line with the intensive margin and extensive margin literature. Fortin et al. (2010) argues that decomposition methods are relevant for policy analysis and can be applied in a variety of settings, hence our motivation in adopting it for this paper.

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A Appendix

Table 6: Summary Statistics - panel data

	count	p25	p50	p75	p95	mean	max
Treated Countries under common support							
Exports to EU	350	122172624	436325755	1.18e+09	6.73e+09	1.64e+09	3.24e+10
Exports to USA	350	8564796	84170659	321903577	8.26e+09	1.35e+09	3.92e+10
Exports to ROW	350	133568848	417463168	1.22e+09	1.92e+10	2.56e+09	5.92e+10
Control Countries under common support							
Exports to EU	400	43540262	487069826	7.81e+09	2.67e+10	5.43e+09	5.28e+10
Exports to USA	397	4044833	143788228	2.73e+09	2.21e+10	3.28e+09	3.69e+10
Exports to ROW	397	197571792	1.40e+09	7.75e+09	6.90e+10	1.25e+10	1.92e+11
All Countries including countries not under common support							
Exports to EU	1100	57999974	359575132	2.05e+09	1.65e+10	3.00e+09	5.28e+10
Exports to USA	1096	6247868	131920578	1.94e+09	1.47e+10	2.46e+09	5.25e+10
Exports to ROW	1096	115290684	636021792	2.83e+09	3.95e+10	6.78e+09	1.92e+11

Table 7: Summary Statistics - Other variables

	count	mean	min	max
Mirror Exports Share-ROW	1536	0.529	0.000725	0.998
Mirror Exports Share-EU	1572	0.303	0.000131	0.999
Mirror Exports Share-USA	1539	0.169	0.000000809	0.959
No program claimed	1650	1.95e+09	0	5.48e+10
GSP Imports	1280	1.56e+08	0	6.26e+09
Non GSP Imports	1650	2.55e+08	0	1.76e+10
Non-GSP/TT Imports	1606	0.115	0	0.988
GSP/TT Imports	1278	0.074	0	1.000
No prog/TT Imports	1606	0.826	0	1.000
Area	1570	4.08e+05	10	8.51e+06
Real GDP	1278	5757.740	145.0	42188.809
Weighted distance	1570	9845.144	2387.8	16764.666
Landlocked	1580	0.139	0	1.000
Voice & Accountability	1370	42.241	0	97.000
Political Stability	1290	41.012	1.500	96.000
Government Effectiveness	1330	42.466	1.500	98.000
Regulatory Quality	1340	42.306	0	100.000
Rule of Law	1340	40.646	0	92.000
Corruption	1330	43.342	0	96.500
Adj. Saving per GNI	975	8.765	-167.5	89.299
GDP per capita	1256	3026.931	62.95	27169.707
AGOA Treatment	1650	0.212	0	1.000
Preference Type	490	1.286	1	2.000
Regions (acc. to World Bank)	1400	3.064	1	5.000
High Income (NonOECD) (HI)	1400	0.157	0	1.000
Low Income (LI)	1400	0.236	0	1.000
Lower Middle Income (LMI)	1400	0.343	0	1.000
Upper Middle Income (UMI)	1400	0.264	0	1.000
Majority Christian	1282	0.495	0	1.000
Majority Muslim	1282	0.303	0	1.000
Other Religion	1282	0.203	0	1.000
Observations	1650			

Export share and preferential import data is for 2001-2010 Data for controls based on data from 1985-1999 in most cases Data from WGI are based on averages for 1996 & 1998

Table 8: List of countries used in analysis

AGOA (Treated)	CS	P
	CSup	CSup
Angola	√	√
Botswana	√	√
Burkina Faso	√	√
Cameroon	√	√
Cape Verde	√	√
Chad	√	√
Congo, DR	√	√
Congo, Rep	√	√
Cote d'Ivoire	√	√
Djibouti	√	√
Ethiopia (excludes Eritrea)	√	√
Gabon	√	√
Gambia, The	√	√
Ghana	√	√
Guinea	√	√
Guinea Bissau	√	√
Kenya	√	√
Lesotho	√	√
Madagascar	√	√
Malawi	√	√
Mali	√	√
Mauritania	√	√
Mauritius	√	√
Mozambique	√	√
Namibia	√	√
Niger	√	√
Nigeria	√	√
Rwanda	√	√
Senegal	√	√
Sierra Leone	√	√
South Africa	√	√
Swaziland	√	√
Tanzania	√	√
Uganda	√	√
Zambia	√	√

Non-AGOA (Control)	CS	P
	CSup	CSup
Afghanistan	√	√
Algeria	√	√
Argentina	√	√
Bangladesh	√	√
Benin	√	√
Bhutan	√	√
Brazil	√	√
Burundi	√	√
Cambodia	√	√
Central African Rep.	√	√
Chile	√	√
Comoro Is.	√	√
Eritrea	√	√
India	√	√
Iran, Islamic Rep.	√	√
Jordan	√	√
Kiribati	√	√
Laos	√	√
Lebanon	√	√
Liberia	√	√
Libya	√	√
Malaysia	√	√
Maldives	√	√
Mongolia	√	√
Morocco	√	√
Nepal	√	√
Papua New Guinea	√	√
Pakistan	√	√
Peru	√	√
Philippines	√	√
Sao Tome & Principe	√	√
Solomon Is.	√	√
Somalia	√	√
Sri Lanka	√	√
Togo	√	√
Tunisia	√	√
Uruguay	√	√
Vietnam	√	√
Yemen	√	√
Zimbabwe	√	√

Non-AGOA (Control)	CS	P
	OCSup	OCSup
Anguila	√	
Antigua and Barbuda	√	
Aruba	√	
Bahamas, The	√	
Bahrain	√	
Barbados	√	
Belize	√	√
Bolivia	√	√
British Virgin Is.	√	
British Indian Overseas Territories	√	
Brunei	√	
Burma (Myanmar)	√	
Cayman Is	√	
Christmas Is	√	
Cocos Is	√	
Colombia	√	√
Cook Islands	√	
Costa Rica	√	√
Cuba	√	√
Curacao	√	
Dominica	√	√
Dominican Republic	√	√
East Timor	√	
Ecuador	√	√
Egypt, Arab Rep.	√	√
El Salvador	√	√
Eq Guinea	√	
F St Micronesia	√	√
Falkland Is	√	
Fiji	√	√
Fr S & Ant land	√	
French Guiana	√	
French Polynesia	√	
Grenada	√	√
Guatemala	√	√
Guyana	√	√
Haiti	√	√
Heard & McDonald Is.	√	
Honduras	√	√
Hong Kong	√	

Non AGOA (Control)	CS	P
	OCSup	OCSup
Indonesia	√	√
Iraq	√	√
Jamaica	√	√
Kuwait	√	
Macao	√	
Malta	√	
Marshall Is	√	√
Martinique	√	
Mayotte	√	
Montserrat	√	
Nauru	√	
Netherlands Antilles	√	
New Caledonia	√	
Nicaragua	√	√
Niue	√	
Norfolk Is	√	
North Korea	√	
Oman	√	
Palau	√	√
Panama	√	√
Paraguay	√	√
Pitcairn Is	√	
Qatar	√	
Reunion	√	
Samoa	√	√
Saudi Arabia	√	
Seychelles	√	√
Singapore	√	
Sint Maarten	√	
St Helena	√	
St Pierre & Miq	√	
St. Kitts and Nevis	√	√
St. Lucia	√	√
St. Vincent and the Grenadines	√	√
Suriname	√	√
Syrian Arab Republic	√	√
Taiwan, China	√	
Tokelau Is	√	
Tonga	√	√
Trinidad and Tobago	√	
Turks and Caicos Isl.	√	
Tuvalu	√	
United Arab Emirates	√	
Vanuatu	√	√
Vatican City	√	
Venezuela	√	√
Wallis & Futuna	√	
West Bank	√	
Western Sahara	√	

CS: Cross section, P: Panel, CSup: Common support, OCSup: Outside common support

Table 9: Logit estimates for propensity score

	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4
Landlocked	0.359	0.521	0.479	1.168
	(0.638)	(0.729)	(0.735)	(0.935)
Low Income (LI)	97.90	179.4^{+}	178.1^{+}	213.8^{+}
	(60.352)	(94.268)	(95.470)	(119.411)
Lower Middle Income (LMI)	79.85*	110.4^{+}	109.8^{+}	133.8^{+}
	(37.811)	(56.525)	(57.244)	(69.293)
Majority Christian	0.786	-17.82*	-17.79*	-29.62*
	(0.754)	(8.875)	(8.867)	(11.851)
Majority Muslim	0.403			
	(0.744)			
Weighted distance (log)	37.66	55.13	45.07	32.22
	(42.504)	(57.855)	(59.116)	(70.694)
Distance Squared (log)	-1.973	-2.892	-2.337	-1.543
	(2.329)	(3.153)	(3.225)	(3.861)
LI $\times$ Real GDP	37.82^{+}	72.04*	72.56*	89.78*
	(20.905)	(35.524)	(36.084)	(45.638)
LMI $\times$ Real GDP	40.56^{+}	82.39*	82.80*	101.8^{+}
	(24.418)	(41.427)	(42.048)	(53.338)
UMI $\times$ Real GDP	50.69^{+}	96.37*	96.70*	119.1^{+}
	(28.703)	(47.885)	(48.594)	(61.404)
Real GDP Squared	-2.949^{+}	-5.838*	-5.872*	-7.186*
	(1.650)	(2.835)	(2.878)	(3.656)
Agric land % of land area		2.247	2.433	2.206
		(1.543)	(1.571)	(2.025)
Other Religion		-17.19*	-17.23*	-28.63*
		(8.679)	(8.667)	(11.533)
Corruption		-1.500	-5.203	-7.301
		(2.740)	(4.774)	(5.799)
Voice & Accountability		-2.520	-2.779	-4.786^{+}
		(2.162)	(2.223)	(2.854)
Regulatory Quality		1.113	1.075	0.742
		(2.312)	(2.349)	(2.815)
LMI $\times$ Corruption		-3.962	-0.295	3.770
		(3.859)	(4.856)	(6.262)
UMI $\times$ Corruption		-3.599		
		(4.580)		
Political Stability		1.285	1.899	2.802
		(1.805)	(2.093)	(2.302)
Muslim $\times$ Real GDP		-2.473*	-2.468*	-4.022*
		(1.229)	(1.227)	(1.626)
GDP per capita (log)		2.916*	3.043*	2.896^{+}
		(1.317)	(1.357)	(1.677)
Area (log)			0.113	0.0521
			(0.186)	(0.225)
LI $\times$ Corruption			3.478	5.872
			(4.636)	(5.748)
Adj. Saving per GNI				-5.849
				(4.915)
Constant	-398.6^{+}	-662.0^{+}	-619.5^{+}	-647.5
	(230.638)	(347.487)	(352.896)	(423.772)
Observations	110	103	103	90
Chi-square	40.41	53.64	54.02	55.94
Log likelihood	-48.60	-39.19	-39.00	-31.17
Pseudo-R square	0.294	0.406	0.409	0.473

Standard errors in parentheses
Estimation results for the propensity score regressions. Dependent variable is the AGOA treatment.
Results in the text are based on Models 1 and 2; results in the appendix are based on model 3
$^{+}$ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 10: Number of Controls and Treated under common support, Model 1

	Non-agoa	agoa	Total
1	2	1	3
2	14	3	17
3	9	5	14
4	5	11	16
5	7	8	15
6	3	7	10
Total	40	35	75

Table 11: Covariate Balancing Tests (All Models)

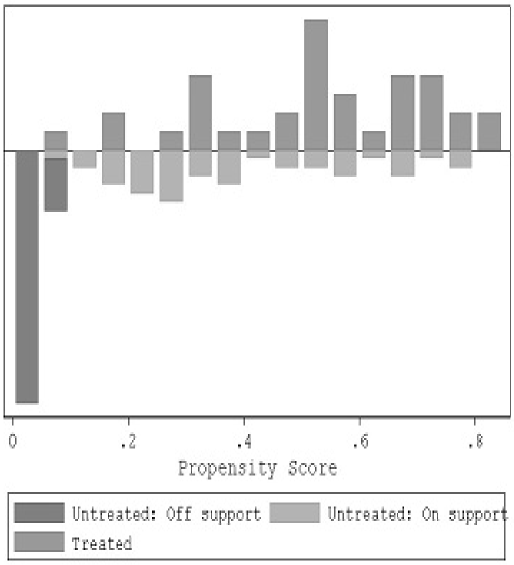
Variable	Sample	Control (Mean)	Treated (Mean)	% bias	% bias reduction	T-test (P-Value)
landlocked	Matched	.371	.343	-6.839	86.364	-.219 (.586)
landlocked	UnMatched	.133	.343	50.154		-2.614 (.01)
Lower Middle Income (LMI)	Matched	.514	.486	-6.303	90.446	-.21 (.583)
Lower Middle Income (LMI)	UnMatched	.187	.486	65.967		-3.384 (.001)
Upper Middle Income (LMI)	Matched	.343	.371	5.783	48.276	.219 (.414)
Upper Middle Income (LMI)	UnMatched	.427	.371	-11.18		.545 (.587)
High Income (HI)	Matched	.143	.143	0	100	0 (.5)
High Income (HI)	UnMatched	.387	.143	-56.962		2.635 (.01)
Majority Christian	Matched	.314	.4	17.198	46.429	.66 (.256)
Majority Christian	UnMatched	.56	.4	-32.103		1.567 (.12)
Majority Muslim	Matched	.371	.371	0	100	0 (.5)
Majority Muslim	UnMatched	.267	.371	22.373		-1.113 (.268)
Other Religion	Matched	.314	.229	-21.206	-55.172	-.712 (.76)
Other Religion	UnMatched	.173	.229	13.666		-.682 (.497)
Weighted Distance (logs)	Matched	9.373	9.334	-9.307	88.132	-.672 (.748)
Weighted Distance (logs)	UnMatched	9.008	9.334	78.416		-3.424 (.001)
Real GDP (logs)	Matched	7.115	7.083	-3.604	96.513	-.149 (.559)
Real GDP (logs)	UnMatched	8.003	7.083	-103.35		4.933 (0)
Distance Squared (logs)	Matched	87.892	87.186	-9.548	87.727	-.662 (.745)
Distance Squared (logs)	UnMatched	81.436	87.186	77.796		-3.413 (.001)
LI × Real GDP	Matched	3.367	3.142	-7.614	88.32	-.253 (.6)
LI × Real GDP	UnMatched	1.218	3.142	65.191		-3.337 (.001)
LMI × Real GDP	Matched	2.522	2.7	4.707	73.958	.186 (.427)
LMI × Real GDP	UnMatched	3.381	2.7	-18.075		.867 (.388)
UMI × Real GDP	Matched	1.226	1.241	.401	99.303	.018 (.493)
UMI × Real GDP	UnMatched	3.404	1.241	-57.577		2.657 (.009)
Real GDP Squared	Matched	51.2	50.835	-2.681	97.417	-.114 (.545)
Real GDP Squared	UnMatched	64.936	50.835	-103.789		4.926 (0)

Table 12: Tests of coefficient equality across four quantiles

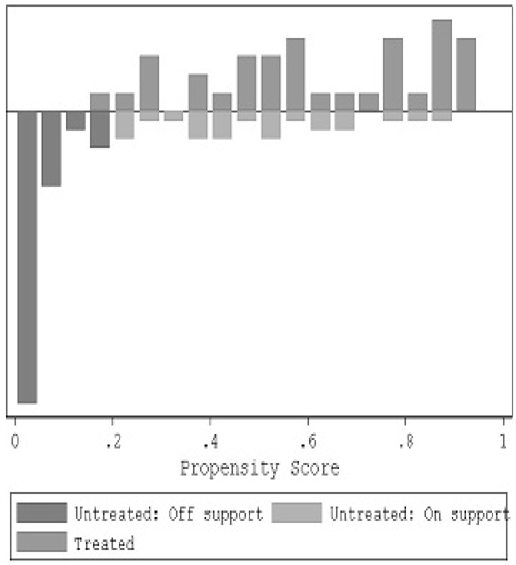
Cross-section				
Variable	F-test (P-value)	F-test (P-value)	F-test (P-value)	F-test (P-value)
Mirror exports to EU	3.123 (.028)	3.692 (.016)	1.378 (.253)	1.646 (.187)
Mirror exports to USA	5.258 (.002)	2.724 (.05)	.961 (.413)	.428 (.734)
Mirror exports to ROW	6.621 (0.000)	.969 (.412)	.158 (.924)	.412 (.745)
Controls	No	No	Yes	Yes
Common Support	No	Yes	No	Yes

Table 13: Tests of coefficient equality across four quantiles

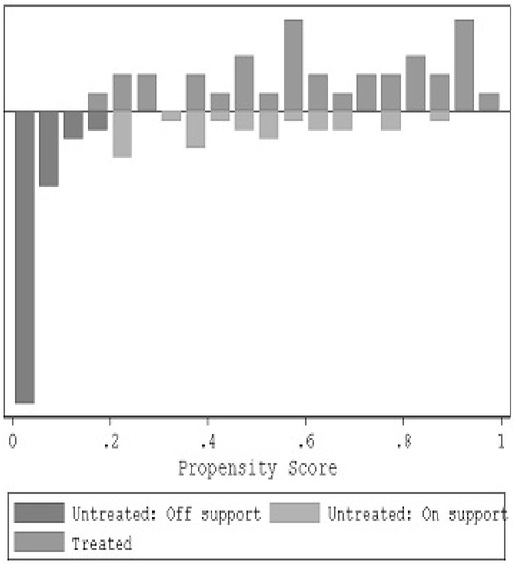
Panel data				
	On common support		Not on common support	
Variable	F-test (P-value)	F-test (P-value)	F-test (P-value)	F-test (P-value)
Mirror Exports to EU	9.936 (0.000)	15.814 (0.000)	20.436 (0.000)	14.371 (0.000)
Mirror Exports to USA	2.054 (.105)	3.248 (.021)	8.809 (0.000)	8.519 (0.000)
Mirror Exports to ROW	1.346 (.258)	2.584 (.052)	.183 (.908)	1.762 (.153)
Year Effects	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes



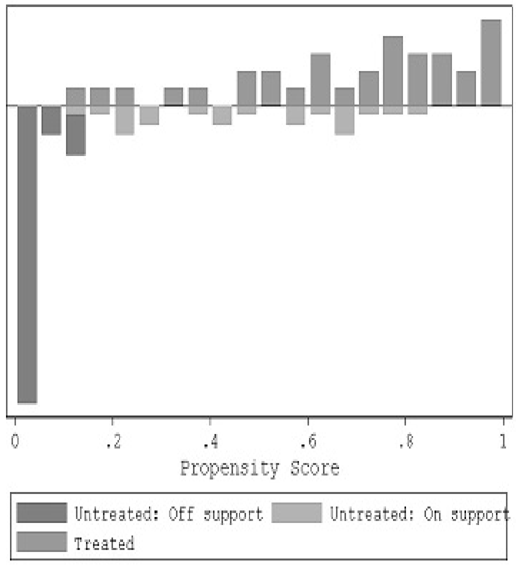
(a) Model 1



(b) Model 2



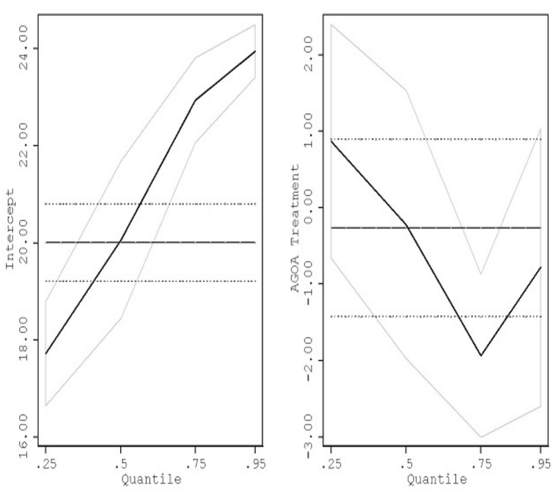
(c) Model 3



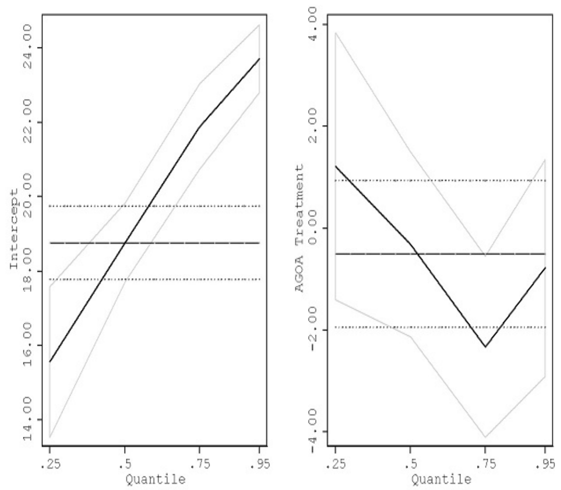
(d) Model 4

Graphs of the region of common support for all four models shown in table (9). The set of countries used in the matched sample for the analysis in the text is based on model 1.

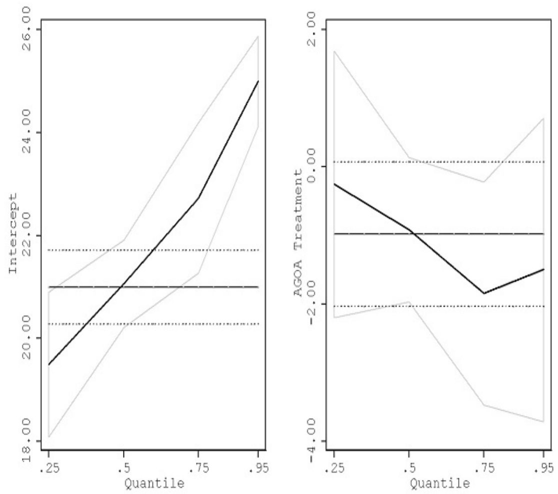
Figure 8: *Propensity score and region of common support*



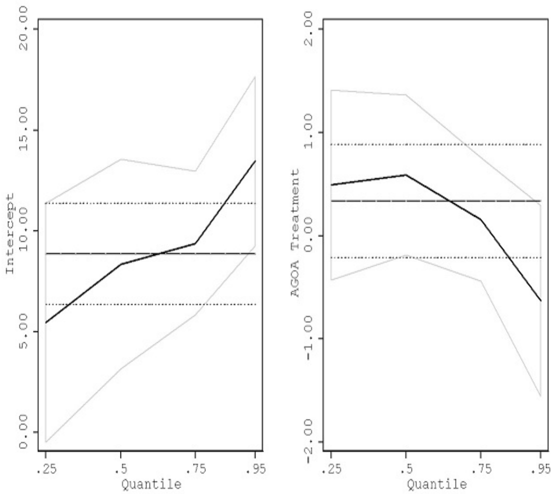
(a) EU–Column 1



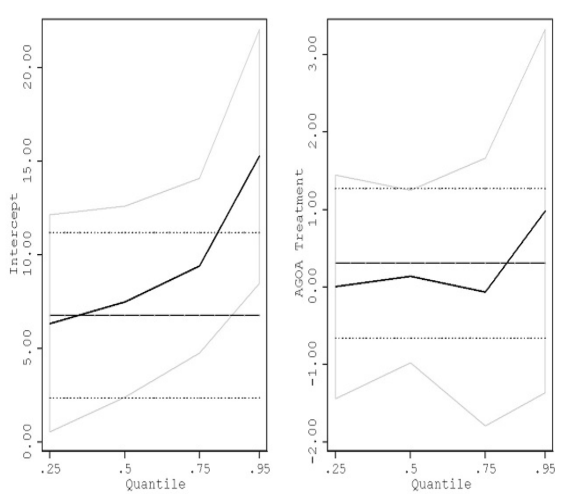
(b) USA–Column 2



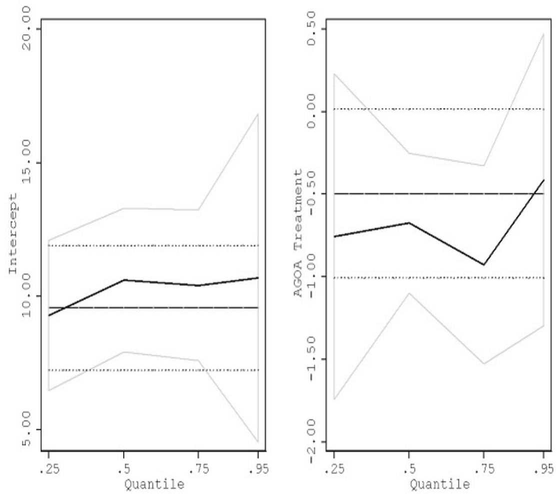
(c) ROW–Column 3



(d) EU–Column 4

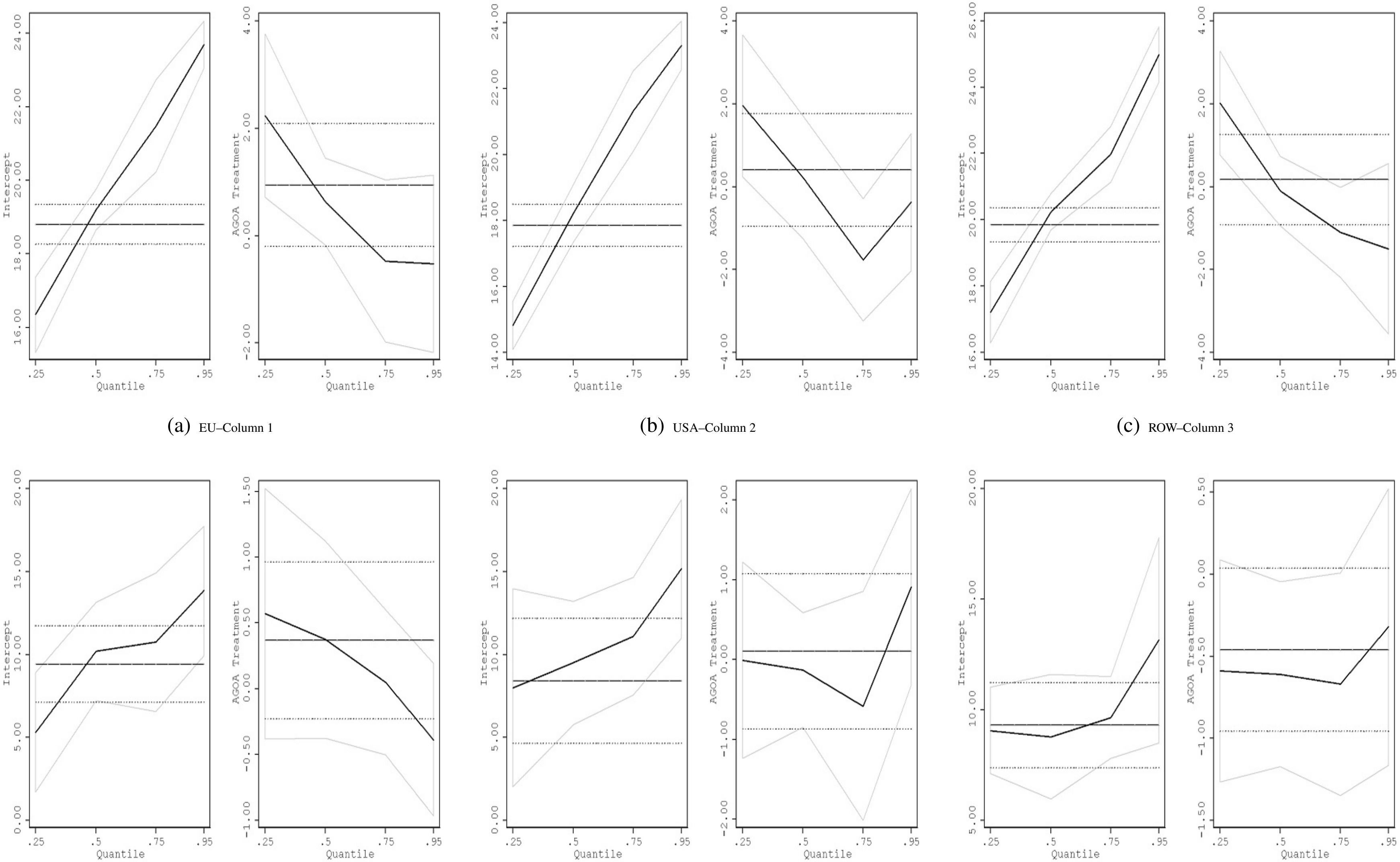


(e) USA–Column 5



(f) ROW–Column 6

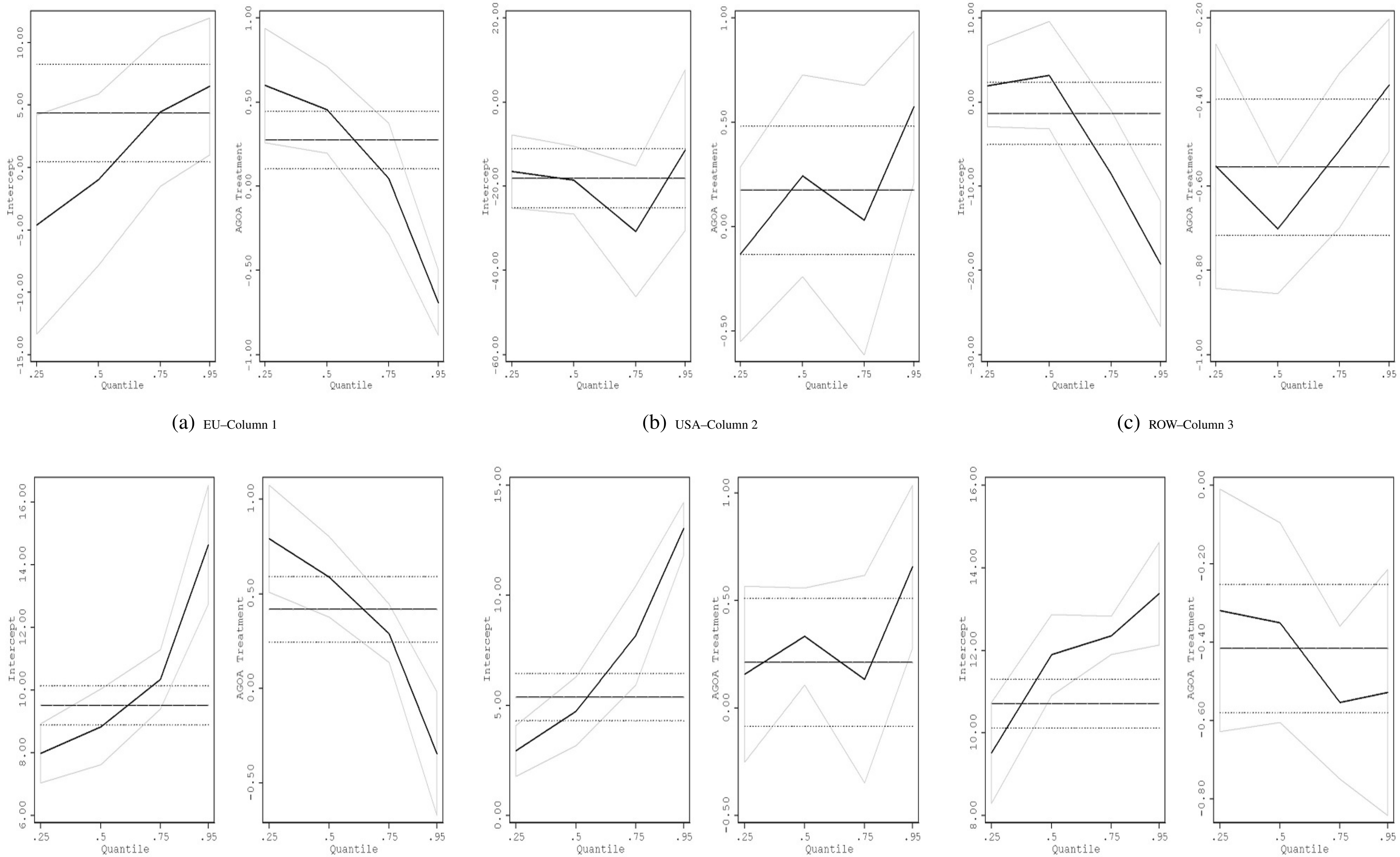
Figure 9: *Estimated quantiles with confidence intervals: based on Table 2*



(a) EU–Column 1 (b) USA–Column 2 (c) ROW–Column 3

(d) EU–Column 4 (e) USA–Column 5 (f) ROW–Column 6

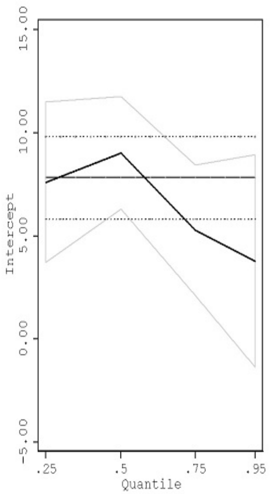
Figure 10: *Estimated quantiles with confidence intervals: Cross-section based on Table 3*



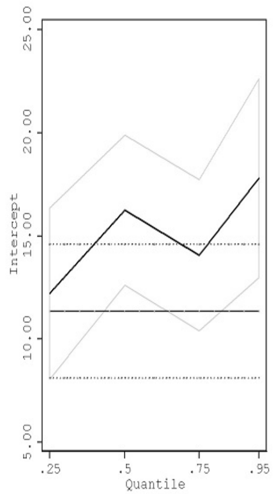
(a) EU–Column 1 (b) USA–Column 2 (c) ROW–Column 3

(d) EU–Column 4 (e) USA–Column 5 (f) ROW–Column 6

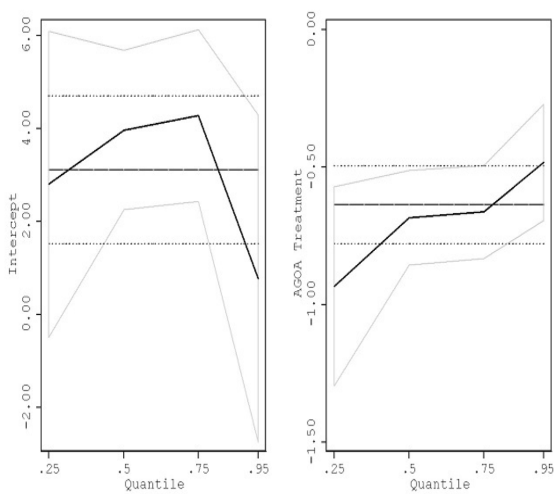
Figure 11: *Estimated quantiles with confidence intervals: Panel data, based on Table 4*



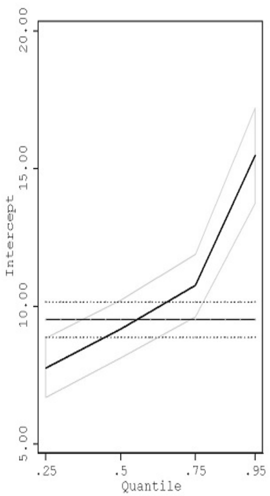
(a) EU–Column 1



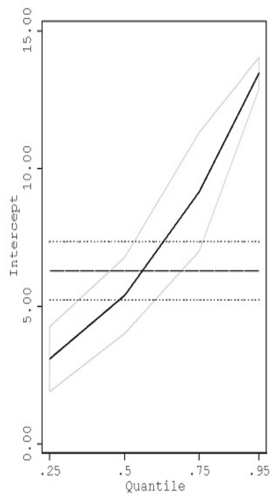
(b) USA–Column 2



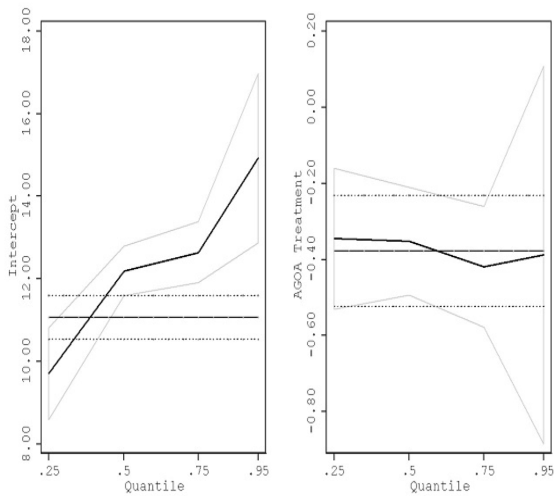
(c) ROW–Column 3



(d) EU–Column 4



(e) USA–Column 5



(f) ROW–Column 6

Figure 12: *Estimated quantiles with confidence intervals: Panel Data, based on Table 5*